HUMMER WIND GENERATOR

MANUAL

HUMMER-3KW

HUMMER Wind Generator is built by three parts:

- Generator body,
- Control system,
- Rectifier-inverter system.

The control system can adjust the operational status of the wind turbine according to the timely wind information and wind generator performance index, and take reasonable and effective protection to the wind turbine to ensure its long-term security and stability in operation.

The rectifier-inverter system integrates the instability current that generated by the wind turbine into a stable power supply efficiently through the rectification and invertion and then supply to the grid or electrical appliance.

ANHUI HUMMER DYNAMO CO., LTD

The content of the Manual has been carefully proofread before publication, but there might be still some differences between the photographs and their physical goods.

Foreword

Dear Owner,

Congratulations!
You have just purchased the most technologically advanced small-scale wind turbine system in the world--HUMMER wind turbine.
We appreciate your purchase, and are proud of providing the excellent product to you.

Before going any further, please completely read the owner's manual, although it is easy to install your wind turbine by yourself.
You will find our great efforts to satisfy your requirements in the aspects of design,manufacture, operation, applicability, etc.

Please keep the manual carefully for further reference.
If you have any questions or comments, we would like to hear from you.

Again, thanks for your purchase and wish you enjoy the convenience that HUMMER wind turbine brings you.

Thanks for using HUMMER wind turbine —
High Quality and Original Technology

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Part I

The Installation of the Wind Generator Main Body

The main body of the HUMMER-5KW wind generator could be assembled both with guy tower or wireless tower.
We specially developed the “hydraulic tower system” for the wireless tower which effectively reduces the wind turbine’s installation and maintenance costs.
Related operations, please refer to <**Manual of Hydraulic Tower System**>

1. Package Contents

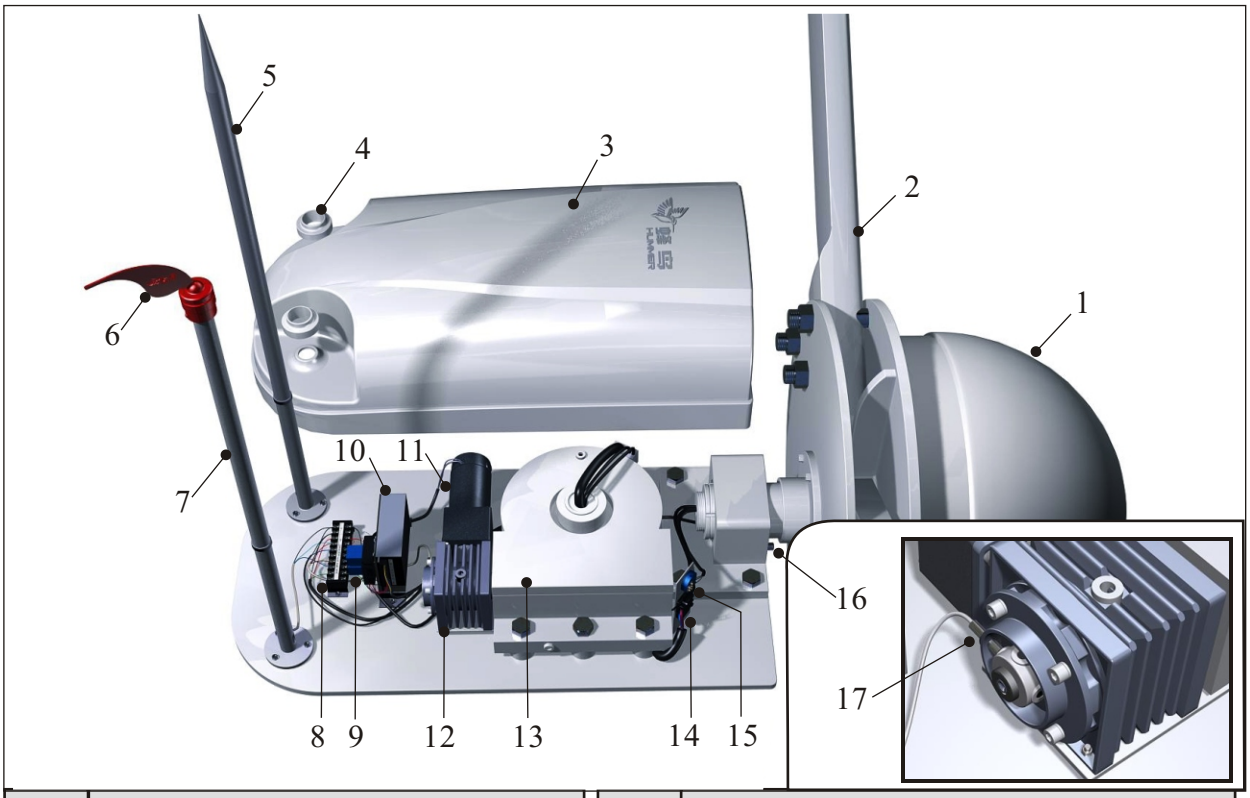
BOX No.		BOX Name	Size of box (L*W*H)	Bill of materials
3KW-1		Generator box	460×460×560	Generator, User's manual
3KW-2	-1	Controller box	550×395×220	HUMMER-3KW wind generator controller
	-2	Rectifier box	650×465×235	Rectifier/Dumping controller
	-3	Dumping load box		Dumping load
	-4	Inverter box	690×580×285	HUMMER-3KW off-grid inverter
3KW-3		Rotor blades box	2400×295×260	Blades(3), L=2.3m
3KW-4		Yaw shaft box	805×405×445	1. Yaw shaft (50m cable) * 2. Pedestal, Tower pin 3. Anemometer, Dogvane, and 2 pieces supporting poles 4. Accessory Box: * a. M12 OO turnbuckle (8 pieces) * b. M8 wire clamp (48 pieces) c. Battery connection wires (1.5m/piece×2) d. Battery connection wires (0.3m/piece×14) * e. M14*60screw(24 pieces) f. M14*60screw(6 pieces) g. One bottle of lubrication h. One acutilingual bottle for adding lubrication
* 3KW-5		Tower box	3235×410×410	1.Tower (4 segments) 2.Φ8 wire rope(4pieces for 15.5m) 3.Φ8 wire rope(4pieces for 13m) 4.Φ8 wire rope(8pieces for 1m)

Note: The items marked with " * " are the accessories for guy tower.

2. Product Structure

HUMMER-3KW wind generator consists of generator body and yaw shaft.

- The generator body consists of generator, blades .
- Yaw shaft system has the direction-regulating function. And consists of gearbox, direction-regulating DC motor and dogvane, etc..



NO	Name	NO	Name
1	Generator	10	DC 24V power supply
2	Blades	11	DC 24V direction-regulating motor
3	Yaw shaft protection cover	12	Speed-reduction of DC24V motor
4	Gland cover	13	Gear box
5	Lighting rod (selection match)	14	Wind generator output cable terminals
6	Dogvane	15	Generator temperature transmitter
7	Support of dogvane	16	Generator rotation speed probe
8	Signal wire terminal block	17	Yaw shaft angle probe
9	Relay		

3. Description of System Function

HUMMER-3KW wind generator is directly driven by rotor blades without any other speedup equipment. The patented wind generator featuring high efficiency and super legerity settles in the cone which is in front of the rotor blades and is helpful to radiate heat.
The whole wind generator system consists of 6 parts:
Generator body (including rotor blades), yaw shaft, tower, wind generator controller, rectifier / dumping load / inverter, and energy storage system (for off-grid system use accumulator; for gird-tied system, power will be transferred to grid directly.)

3.1. Dogvane: It receives wind signal, indicates wind direction, and read the average value of the angle measured by the dogvane every 120s. If the reading angle by the dogvane is larger than 10°, the wind generator controller will drive the DC 24V direction-regulating motor with yaw shaft to deviate to fulfill the function of facing wind automatically.

3.2. Anemometer: It measures wind speed, if the measured wind speed is over the required wind speed for the wind generator to start continuously within 30s, the wind direction auto tracking system will start up and the controller will drive the DC 24Vregulating-direction motor to seek the wind direction automatically. When the blades are the facing the wind direction, they can receive the maximum wind energy, and when the blades parallel to the wind direction, they can not receive any wind energy, and hence stop running.

CAUTION:
The factory-set start-up wind speed value of the wind generator is 1m/s. If the wind speed is less than the required start-up wind speed value, the system will keep in standby mode. Users can change the start-up wind speed of the wind generator in the "User Parameter" window according to the actual needs.

3.3. When blades rotate too fast owing to high wind speed, the controller will alarm for "over speed". And the controller will drive DC 24V direction-regulating motor with yaw shaft to deflect wind direction about 30° at this time. If the blades still rotate too fast, the controller will further drive blades to deflect wind direction 60°, and then the blades will be parallel to wind direction and stop running. After 5mins, the controller will drive the DC 24V direction-regulating motor to seek wind direction again.
The controller will drive the DC 24V direction-regulating motor make the blades deviate 90°and parallel to wind direction if any of below situations occurs.

I.When the wind generator's temperature is up to145°C.the controller indicates "over temp"
II.Wind speed is too high and over 18m/s
III.Rotation speed is higher than the maximum rotation speed and the controller indicates "over speed"

CAUTION:

- When any of the above situations occurs, the blades are parallel to wind direction. In 5 minutes, if the alarm signal disappears, the controller will drive the blades to seek wind direction. If the alarm signal still exists, the blades will keep parallel to the wind direction.
- All above functions are based on the "Auto mode".

3.4. Manual Tracking Function:

Select “Manual” window on the screen of controller, click “mode switch”, and then the track mode will be switched from “Auto mode” into “Manual mode”. Under “Manual mode”,

- keeping on pressing the “Reversion” button, yaw shaft rotates and the positive angle keeping increasing;
- keeping on press the “Corotation” button, the negative angle keeping increasing, During this process, the yaw shaft can stop at any angle in the range of -270 º ~ +270 º to realize the function of Manual tracking.

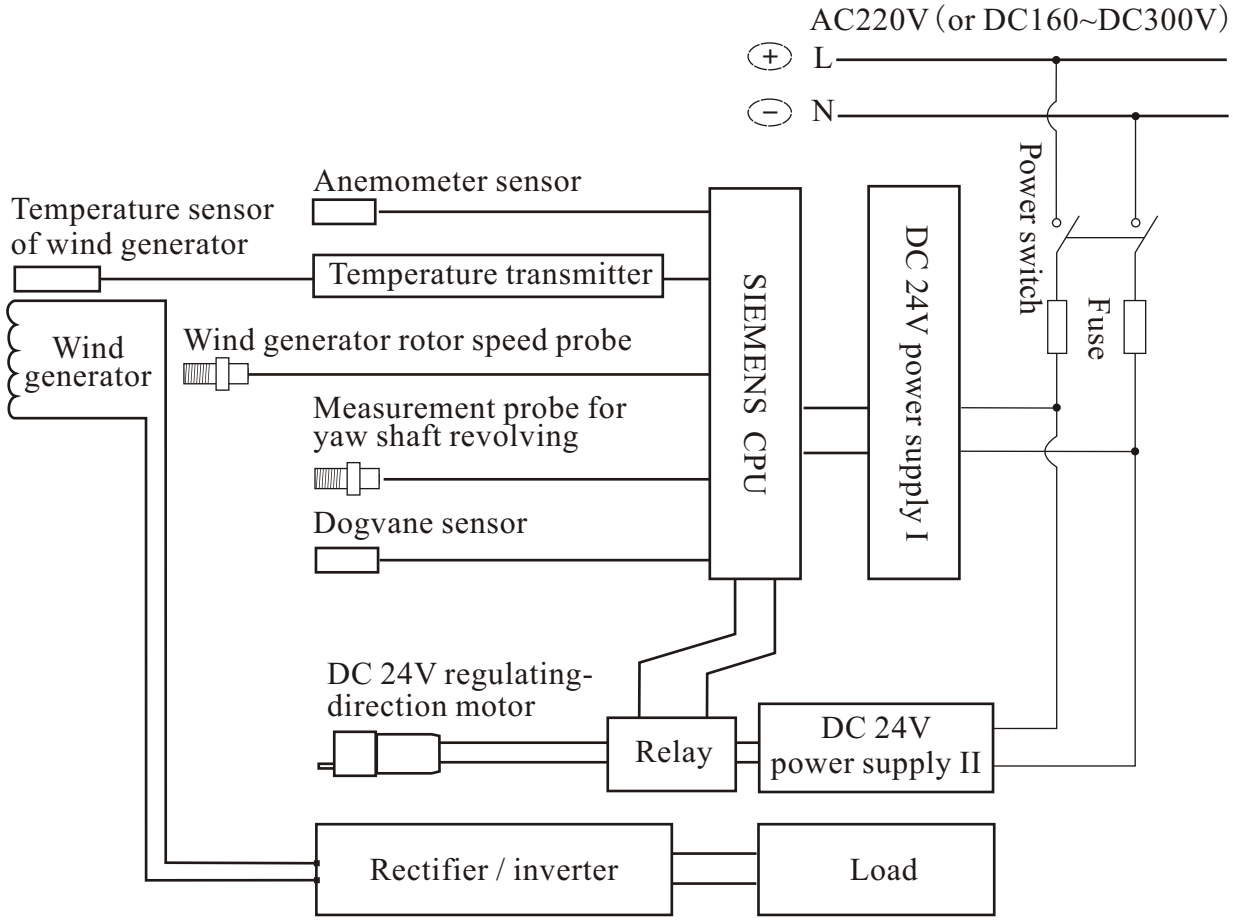
CAUTION:

When the wind speed is higher than 18M/S, in order to protect the wind generator system from any unpredictable damage, user can use “manual track” function to set the blades aside or back to wind direction which can make the wind generator stop working. Or set the blades 30° ~ 45° off the wind direction. In this way, the wind energy received by the blades will decrease, and the rotation speed will slow down.

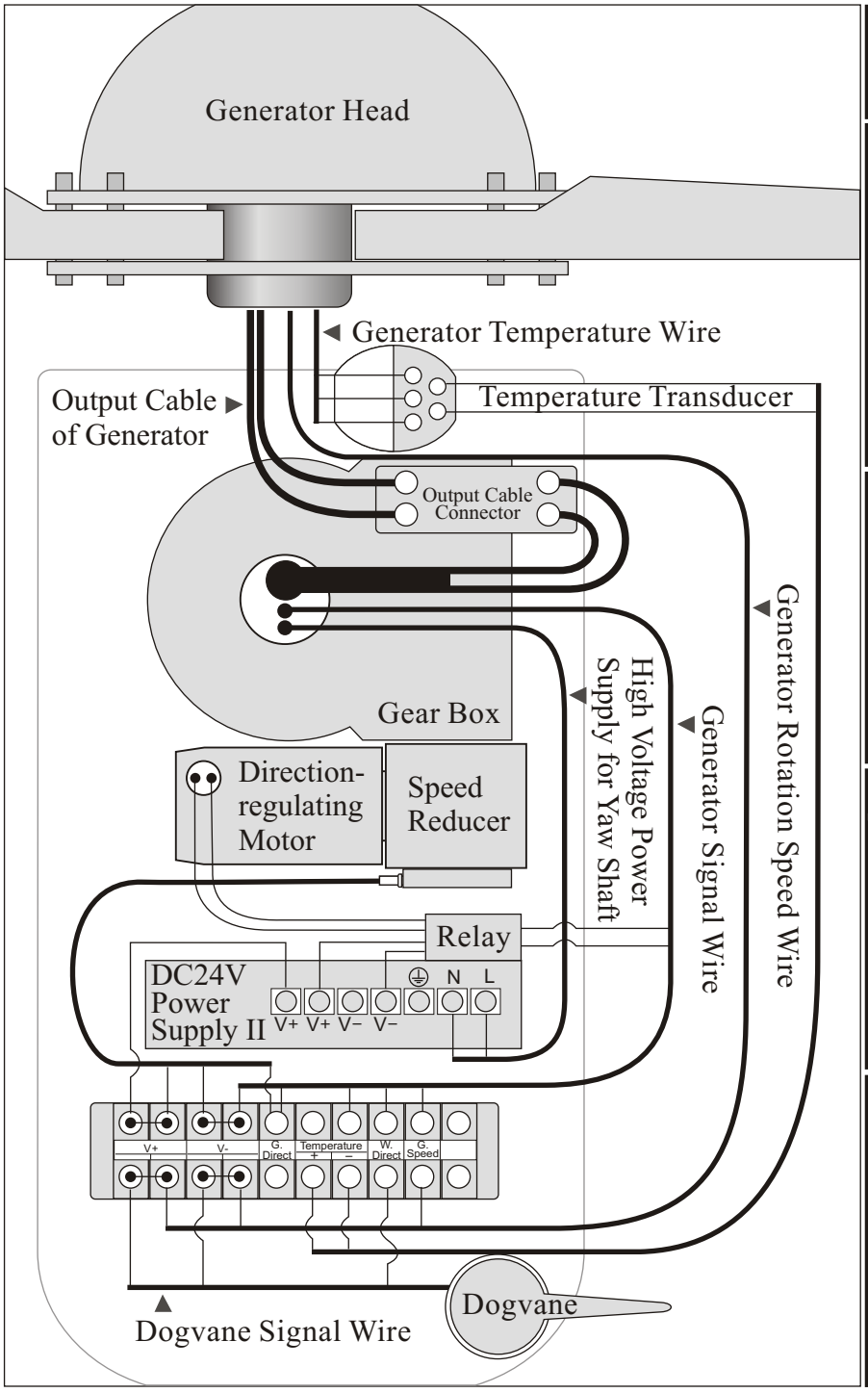
3.5. Time Needed for Direction-regulating:

It takes 180 seconds for the yaw shaft with the blades rotating a circle (360°).
And 15 seconds for deflecting 30° from facing wind and 45 seconds for deflecting 90°.

3.6. Wind Generator Schematic Circuit



3.7. Diagram for the Wire Connection of Yaw Shaft and Generator



Name	Terminal Mark	Connect to
Output Cable of Generator	U	Output Cable Connector (inter changeable)
	V	
Generator Temperature Wire	Temp1	Temperature Transducer
	Temp2	
	Temp3	
Generator Rotation Speed Wire	G.Speed	Signal Wire Terminal Block
	V−	
	V+	
Dogvane Signal Wire	W.Direct	Signal Wire Terminal Block
	V−	
	V+	

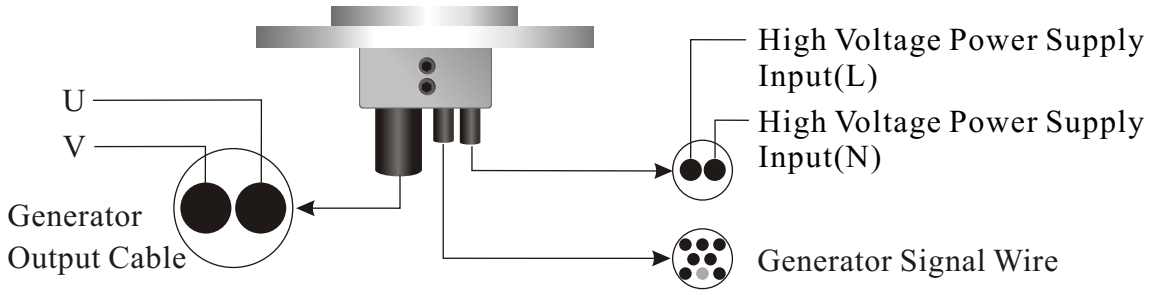
CAUTION:

Please connect the 4 main cables from generator (2 output cables, 1 rotation speed wire, and 1 temperature signal wire) and dogvane signal wire to the terminal block on yaw shaft accordingly.

4. Cable for Transmission and Control Communication

As it is shown in the following picture, there are three main cables.

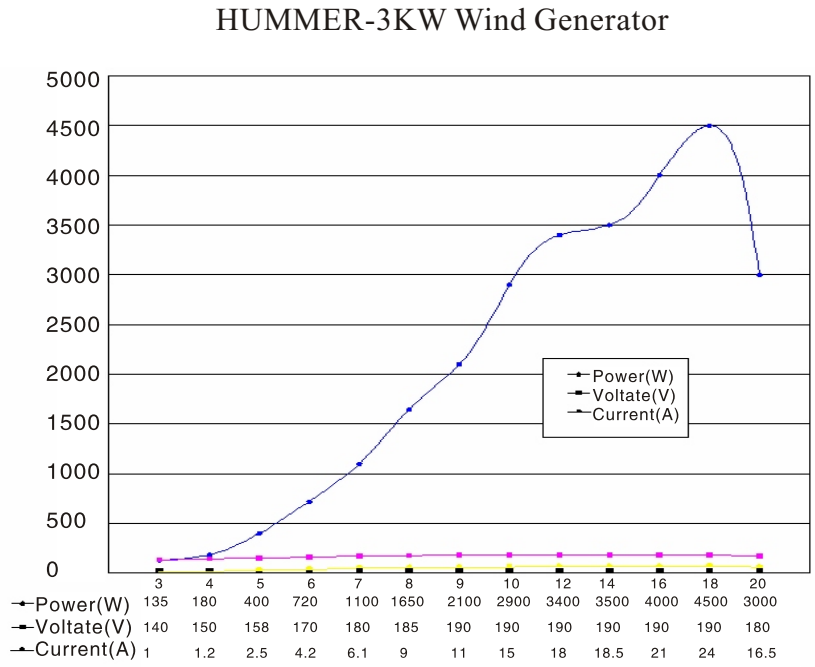
- One is the AC output cable of wind generator with the specification of 2*6 mm^2.
- One is high voltage power supply wire for DC24V direction-regulating motor with the specification of 2*1 mm^2, it will be transformed by Power Supply II into 24VDC on yaw shaft and then supplied to DC24V direction-regulating motor.
- One is for the signal transmission for the whole system with specification of 8*0.3 mm^2. They are for generator rotation speed signal, yaw shaft rotation angle signal, generator temperature signal, dogvane signal and the power wires for them.



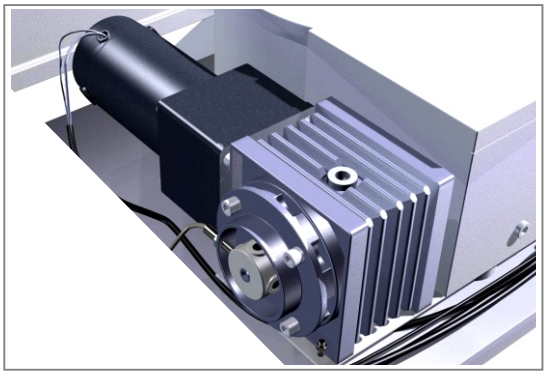
5. Technical Parameters

Rated power(W)	3000
Maximum output power（W）	4500
Charging voltage (V)	DC 180V
Blade quantity	3
Rotor blade material	GRP
Rotor blade diameter（m）	Φ4.8
Start-up wind speed (m/s)	2.5
Rated wind speed (m/s)	10
Rated rotating rate (r/min)	265
Wind energy utilizing ratio (Cp)	0.4
Generator output	Single-phase frequency conversion AC
Rated charging current (A)	16.7
The maximum charging current(in a short time)(A)	28
Output AC frequency (Hz)	0～360
Generator efficiency	＞0.8
Wireless tower diameter(mm)	Φ440× Φ127×12000(2 segments)
Guyed tower diameter(mm)	Φ140×3000×4(4 segments)
Tower height(m)	Wireless tower:12m; Guyed Tower: 12m
The weight of generator(kg)	71.8
Battery 12V 150Ah/200Ah	15 pieces

6. Power Curve



7. Speed-reduce Direction-regulating Motor



7.1. Speed-reduce regulating-direction motor is a motor that require a power supply of DC 24V and consists of two parts as the speed reducer and direction-regulating motor. Normally, it consumes 35W to 60W to regulate the direction of the blades. When there is strong wind or too heavy load, the instantaneous consumed maximum power might reach up to 250W.
If the consumed power surpasses 250W, the controller will protect it automatically and cut off the power supply to direction-regulating motor. And power will be supplied again in 120 seconds.

7.2. Power Supply to Speed-reduce Direction-regulating Motor:
The AC220V from the grid or DC160~DC300V power supply will be transmitted to DC 24V power supplyII which is on the yaw shaft, converted into DC 24V and supplied to the direction-regulating motor through the relay, which is under the control of HUMMER controller.

8. Assembling Steps of Freestanding Tower System

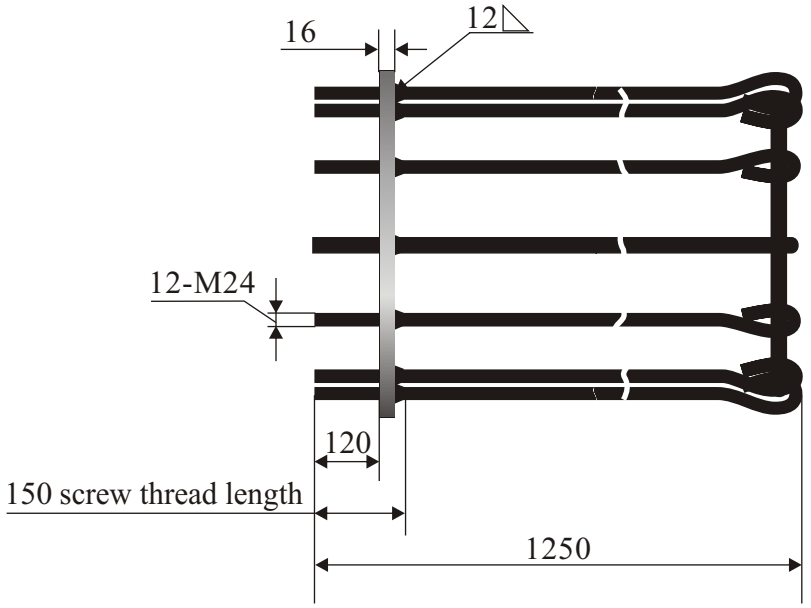
8.1. Open the Packing

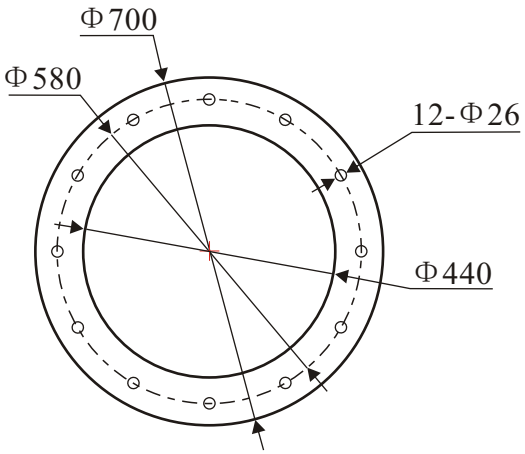
HUMMER-3KW wind generator freestanding tower system consists of 7 packing boxes: generator box, inverter box, blades box, yaw shaft box, controller box, rectifier box, dumping load box, (towers are packed individually with no packing box).

8.2 Precasting Pedestal and Digging Hole

8.2.1 Precasting the Tower Pedestal

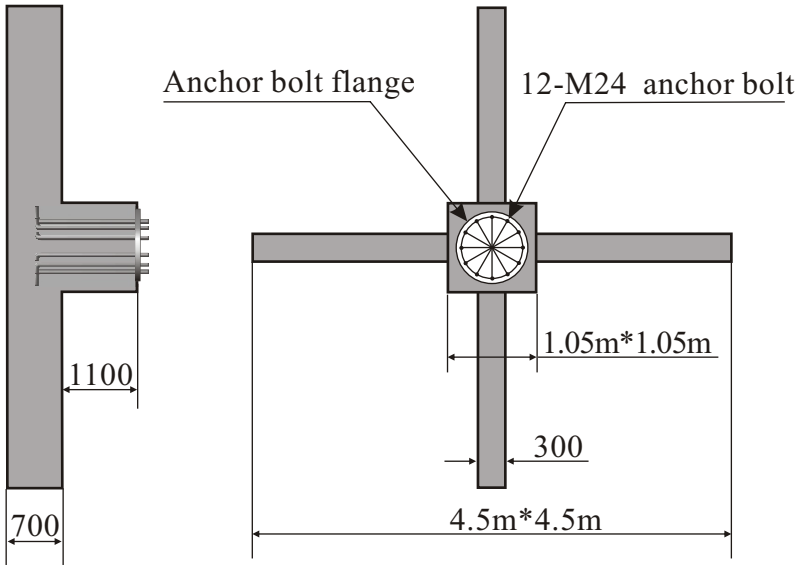
Precasting tower pedestal by concrete (C25)
Size of the concrete of tower pedestal：1.05m×1.05m×1.8m (L*W*H)
Size of reinforced concrete: 4.5m×0.3m×0.7m (L*W*H)
Size of tower pedestal：Φ700×Φ440×16mm



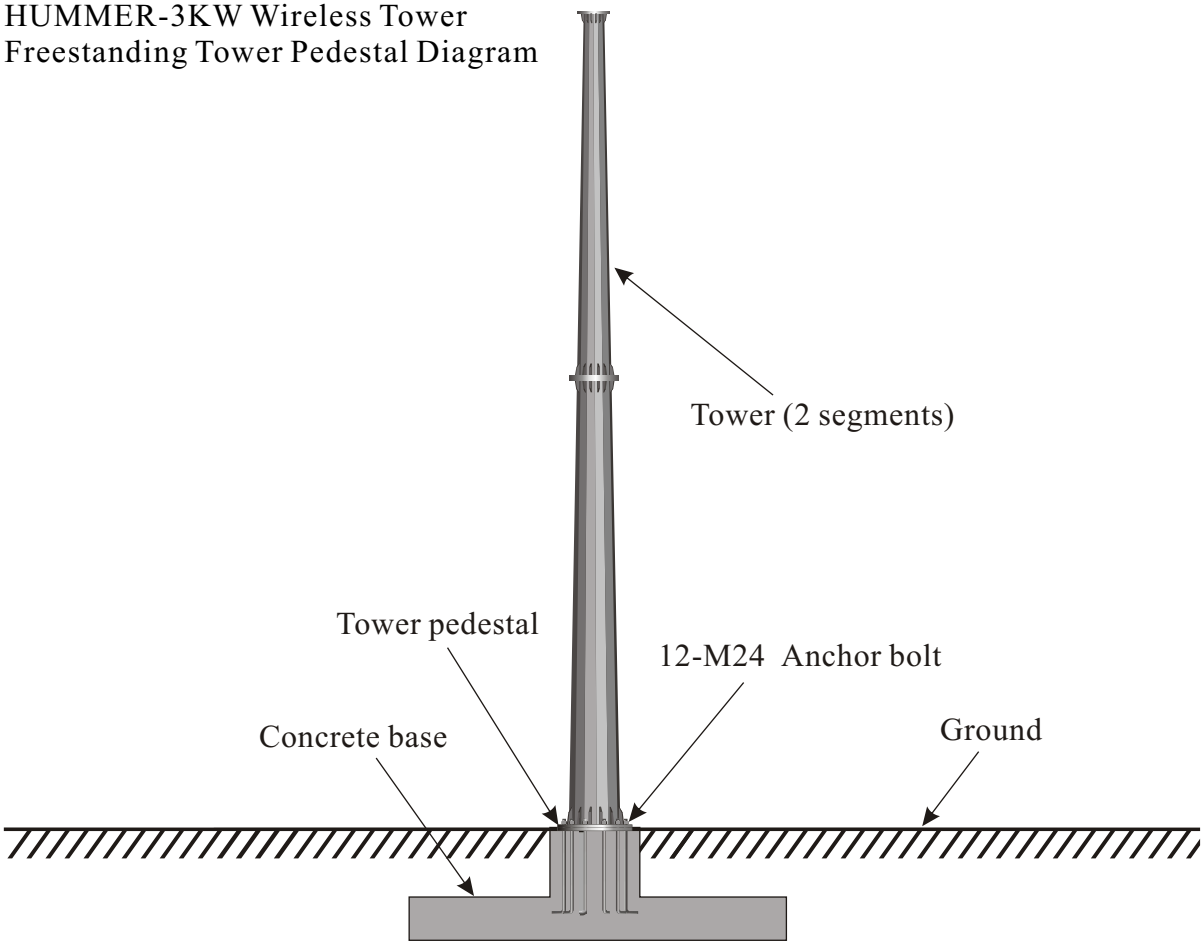


HUMMER-3KW Wireless Tower Anchor Screw Working Diagram

HUMMER-3KW Pedestal's
Concrete Base Specification



HUMMER-3KW Wireless Tower
Freestanding Tower Pedestal Diagram



CAUTION:

The M24 anchor screw and pedestal fixed plate shall be used only after special anticorrosion treatment, such as Hot Galvanizing.

8.2.2. Dig Hole

Dig the hole as per the given size in "3KW Pedestal's Concrete Base Specification", well weld the tower pedestal and put it into the hole after anti corrosion treatment, then butt weld the reinforcing steel bar in the concrete with the tower pedestal (before welding, use a leveling rod to keep it level, incase the tower is slantwise after its being erected). Fill with soil after pouring concrete.

CAUTION:

Please use paper or other materials to encase the bolts on pedestal to avoid the damage from the splashing cement.

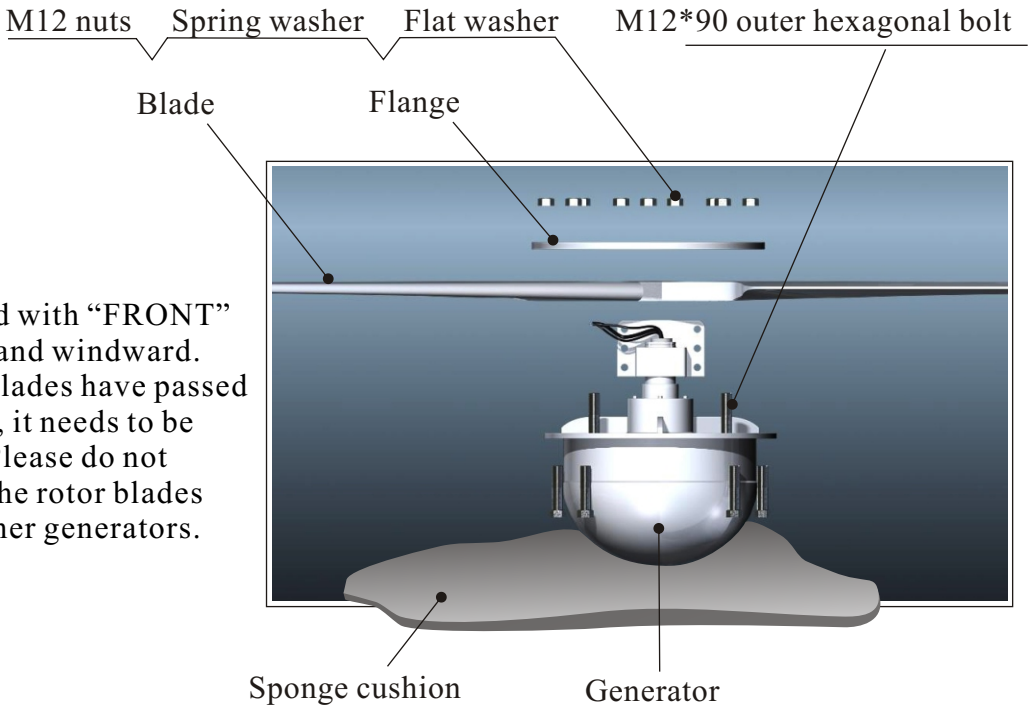
8.3. Blades Assembling

8.3.1. Pull the steel wire through any of the holes on the generator connection base. Use crane to pull out the generator from the packing box, then put it on the sponge cushion, take off all the nuts, bolts and blades fixing flange from it.

⚠ **WARNING**:

There is a generator rotation speed probe on the Generator Head. When lifting the generator head, tie the steel wire at this position is forbidden.

8.3.2. Take out the blades, connect the 3 blades properly to the flange, then cover the flange and fasten the nuts.(As blades need accurate position, bolts must be fastened tightly against blades. Please use a hammer to hit the bolts in the corresponding hole).



CAUTION:

The side marked with "FRONT" shall be adown and windward. All the 3 rotor blades have passed the balance test, it needs to be used together. Please do not disorderly use the rotor blades belonging to other generators.

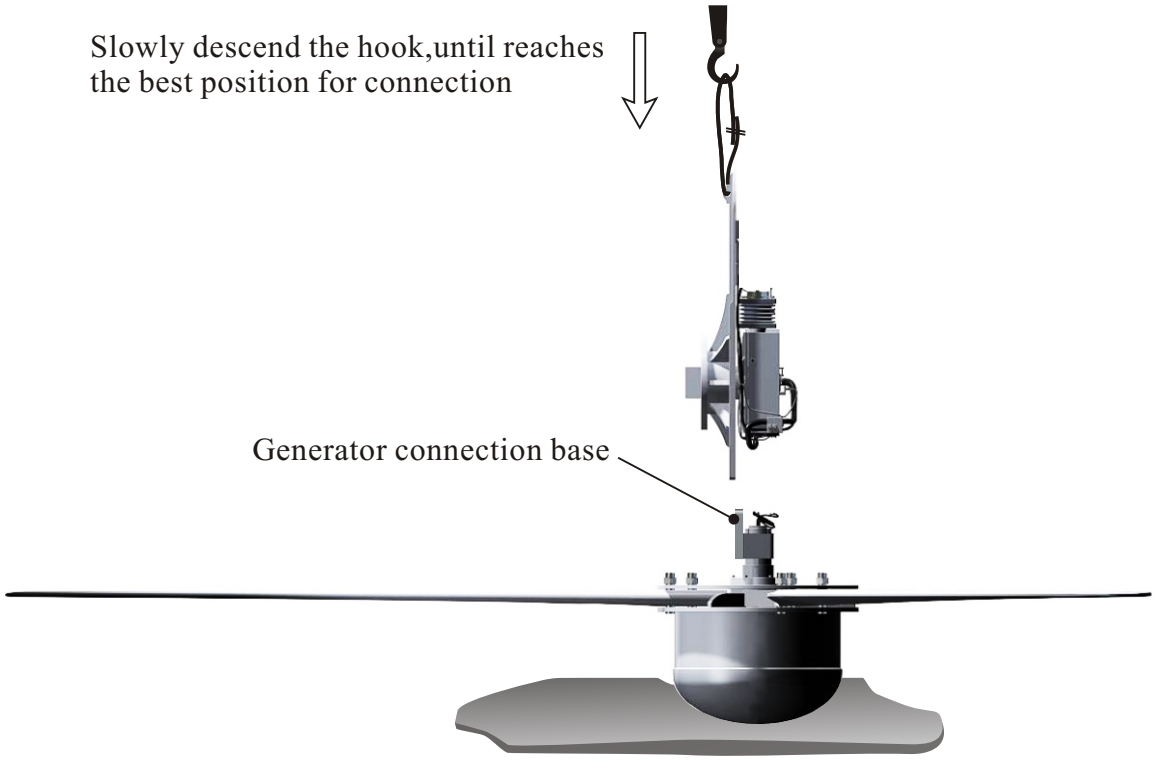
8.4. The Connection of Generator Head and Yaw shaft

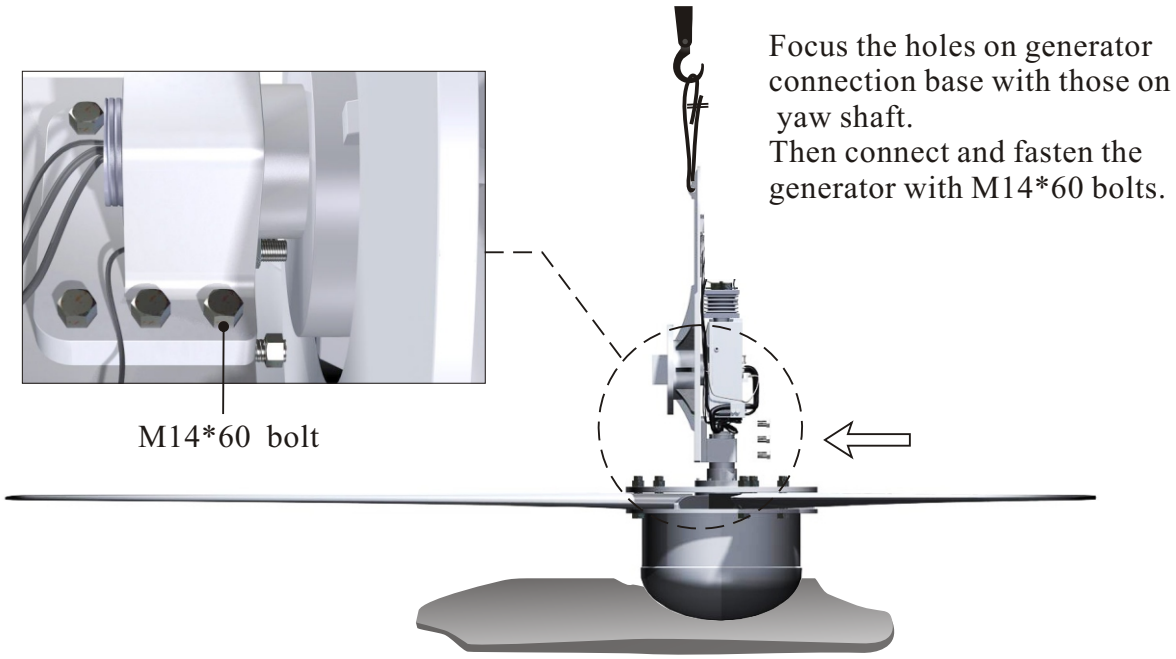
8.4.1. Lifting the yaw shaft

Put steel wires through the lifting hole under the soleplate of the yaw shaft. Lift the yaw shaft with the hook. Then, after the yaw shaft has been lifted, slowly descend it until the best position to fix it with the generator on the ground.

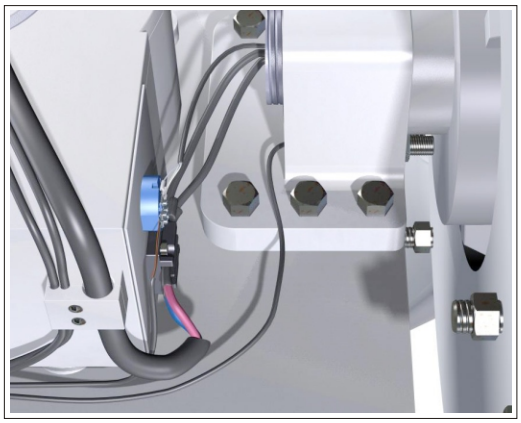
8.4.2. The assembly of generator head and yaw shaft.

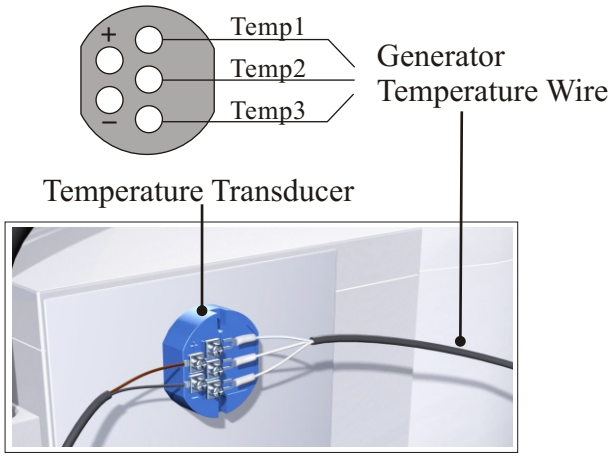
Focus the screw hole in the generator connector with those in the yaw shaft soleplate, and then fix the generator to the yaw shaft with M14*60 bolt, and then fasten the nuts.




Focus the holes on generator connection base with those on yaw shaft.
Then connect and fasten the generator with M14*60 bolts.
M14*60 bolt

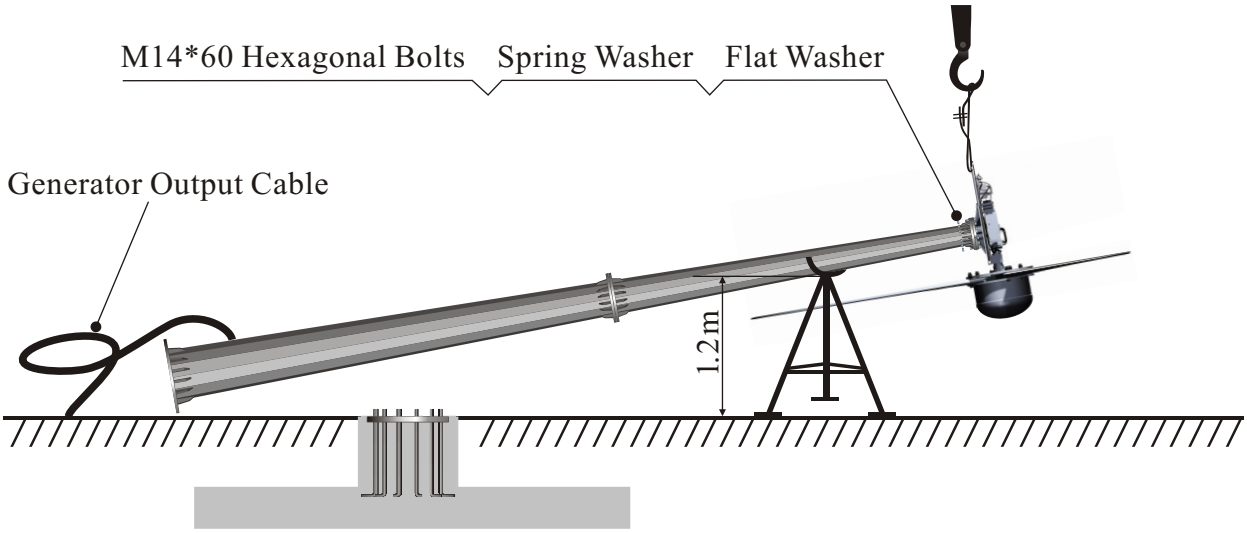
8.4.3. Connect the two output cables of the generator (U/V) with the connector, and fasten them tightly. (These two cables can exchange the location.)
8.4.4. Connect the three small cables in the generator rotation speed wire (G. Speed / V−/ V+) to the respect signal cable terminals on the yaw shaft.
8.4.5. Connect and fasten the generator temperature wire to the temperature transducer which is at the side of gearbox.





CAUTION:
There are three outgoing cables for measuring generator temperature, connect the one marked “Temp 1” to the terminal block on the top of the temperature transducer, and the other two (Temp2/ Temp3) to the below terminal blocks , as shown in the pictures.

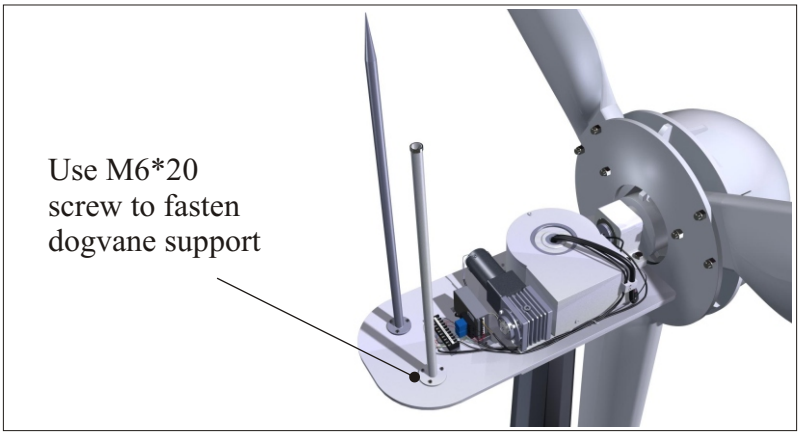
8.5. The Connection of Generator and Tower
8.5.1. Drive the cable under the yaw shaft with a wire and put it through from the top of the tower to the bottom hole until it is taken out.
8.5.2. Fasten the supporting base of the yaw shaft with the flange on top of the tower with M1***4*6***0 hexagonal bolts, and then deadlock the nuts.



HUMMER-3KW Tower and Yaw shaft Connection Diagram

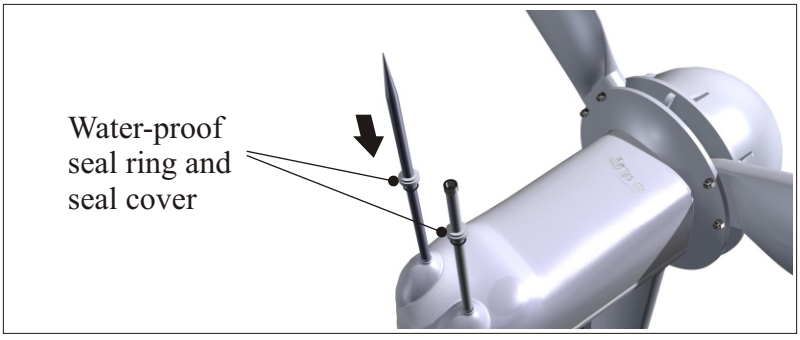
8.6. The Assembling of the Support and Dogvane

8.6.1. Connect dogvane support to the yaw shaft with M6*20 inner Hexagon screw,fasten tightly.



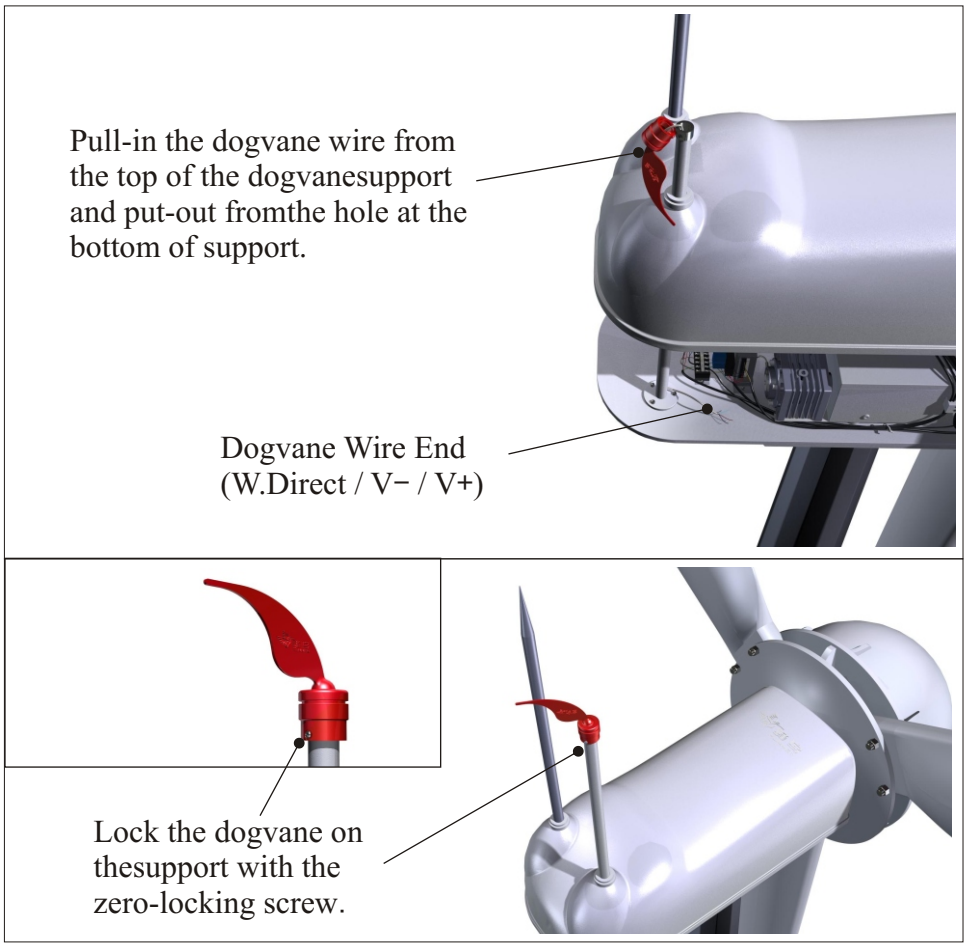
8.6.2. Put the yaw shaft protection cover to the yaw shaft through the support of dogvane.

8.6.3. Put the seal ring into the sealing cover, then insert the support of dogvane into the sealing cover and tighten them.



8.6.4. Hold up the protection cover, then pull in the dogvane signal wire from the top of the support and pull it out from the bottom of the support, then connect the three small dogvane data wires (W. Direct/V−/V+) to the corresponding location of the signal wires terminal block.

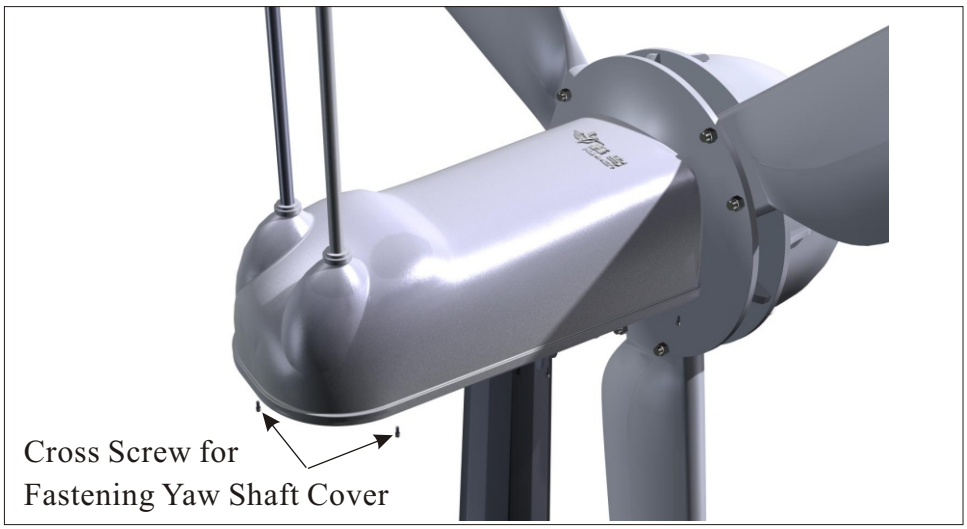
8.6.5. Put the dogvane onto the support. Make the zero-position hole of the dogvane fit with screw hole on the supporter and then fasten it with the cross screw.


Pull-in the dogvane wire from the top of the dogvanesupport and put-out fromthe hole at the bottom of support.
Dogvane Wire End (W.Direct / V− / V+)
Lock the dogvane on thesupport with the zero-locking screw.

8.7. Assembling of the Lightning Arrester

If you selected the lighting rod, please fix the lighting rod well to on the bottom plate of the yaw shaft when you assemble the support of the dogvane before installing the protection cover of yaw shaft.

8.8. Covered the yaw shaft with protection cover, fix it to the yaw shaft with M6*18cross screw. Tighten the water proof cover along the dogvane support.



8.9. Erecting the Tower

Suggested method: Use the crane

Tie the top of the tower with canvas strap. Then hang the strap on the hook of the crane. Gradually lift the arm of the crane and the generator is erected simultaneously, until the tower is vertical to the ground. Making an aim at the anchor screws, slowly put down the tower and fasten it. See as the following photos.

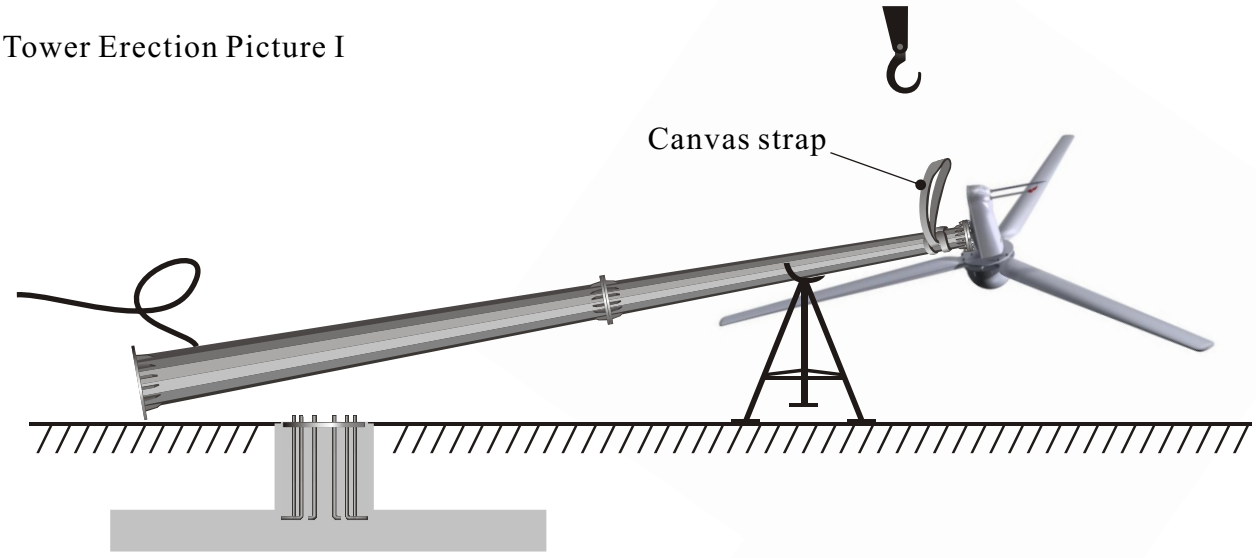
CAUTION:

I. It is important for you to consult with a local specialized tower installation technician, better with who has electric tower or outdoor billboard erection experience.

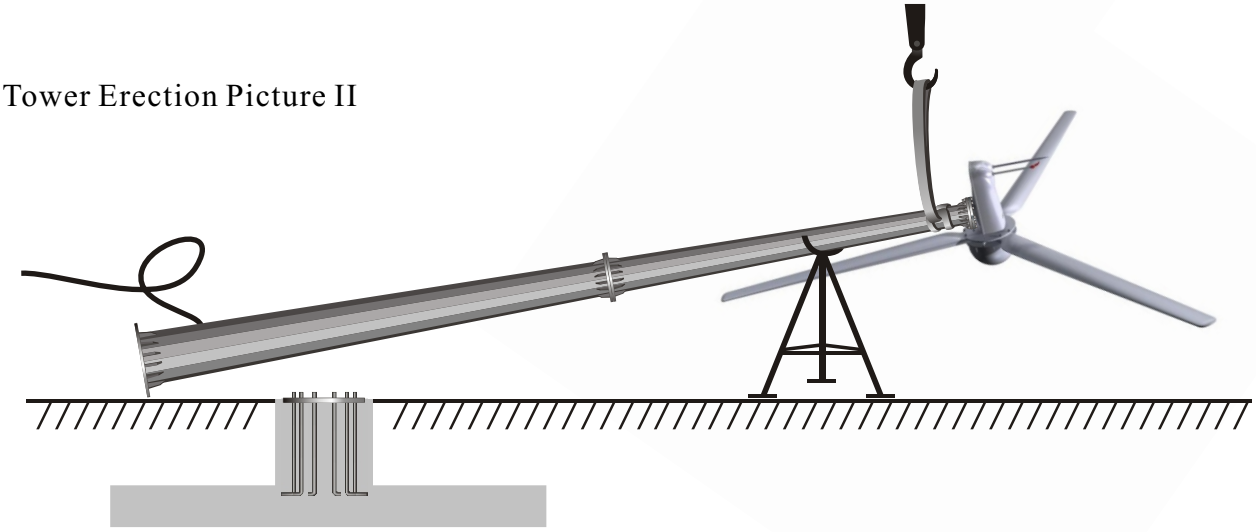
II. Make sure the two power cables are short circuited and connected together in order to avoid blades rotation during the process of erecting.
Operation method: Insert two generator output cables into the corresponding connector (Wind generator) in Rectifier/Dumping controller and then fasten them. Place “Wind generator stop/operation” switch at the “stop” position.

III. Safety shall be first concern in the process of erection and adjusting, be careful of tower falling, which would dndanger the safety of the field worders.

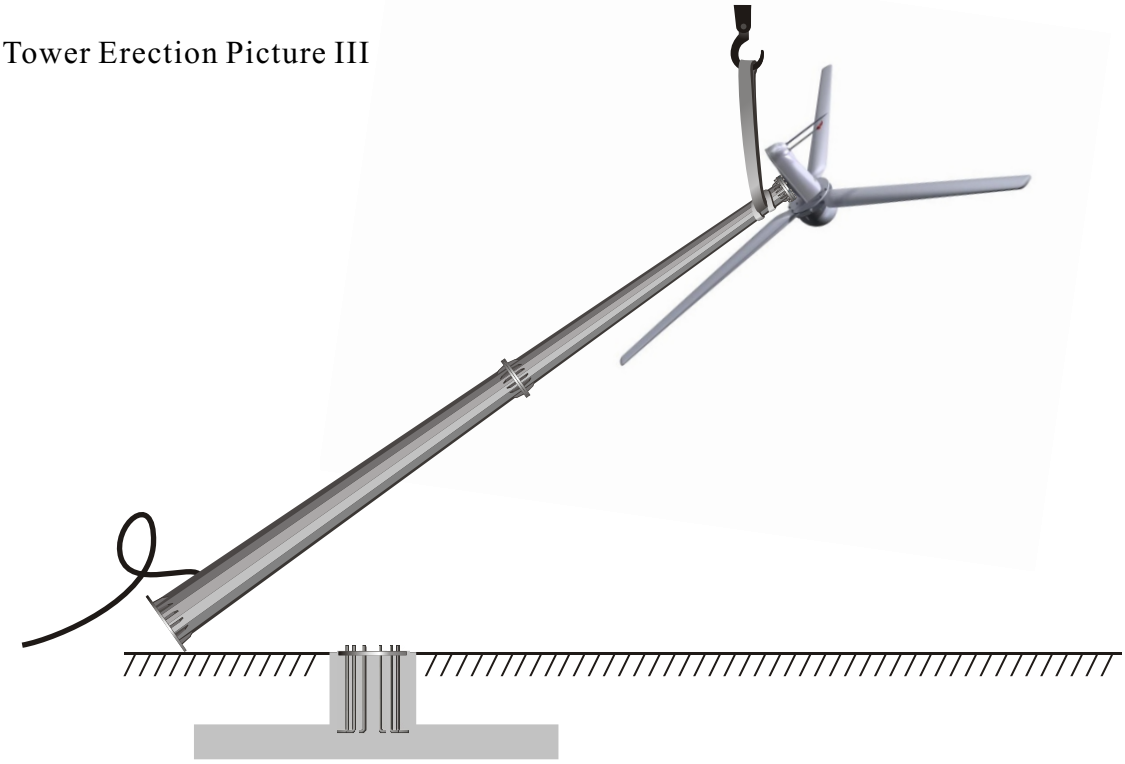
Tower Erection Picture I



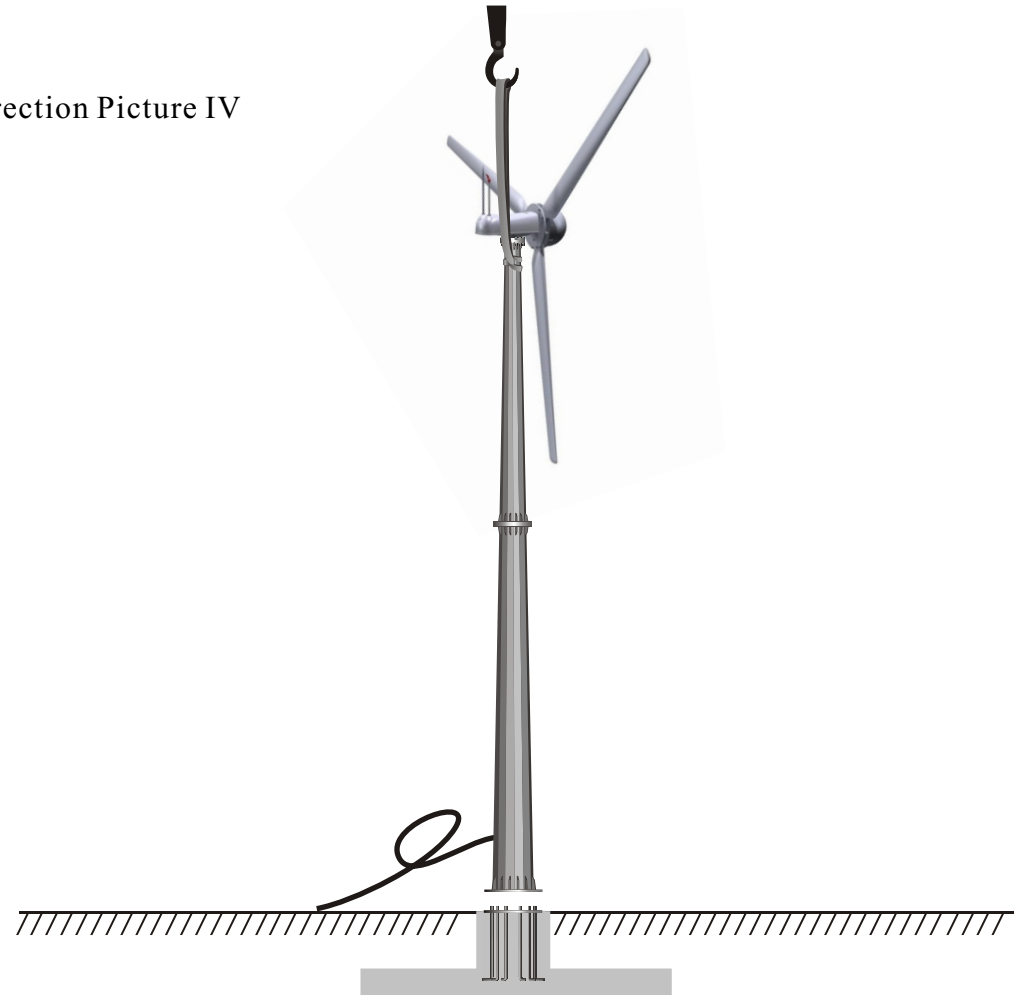
Tower Erection Picture II



Tower Erection Picture III



Tower Erection Picture IV



9. Assembling Steps of Guy Tower

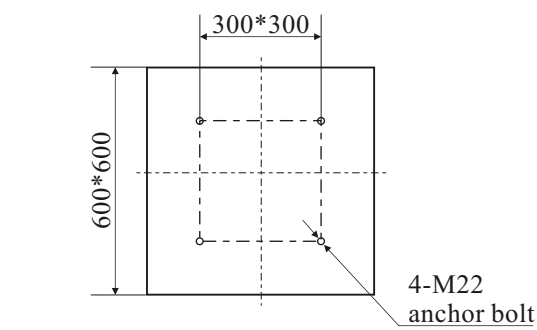
9.1. Open the Packing Box

HUMMER-3KW guyed tower wind turbine consists of 8 packing boxes including generator box, inverter box, blades box, yaw shaft box, tower box, controller box, rectifier box and dumping load box.

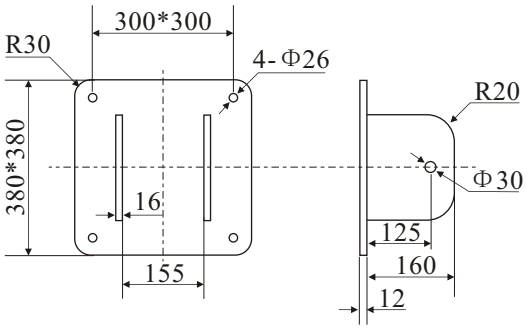
9.2 Precasting the Tower Pedestal and Digging Hole

9.2.1 Precasting the Tower Pedestal

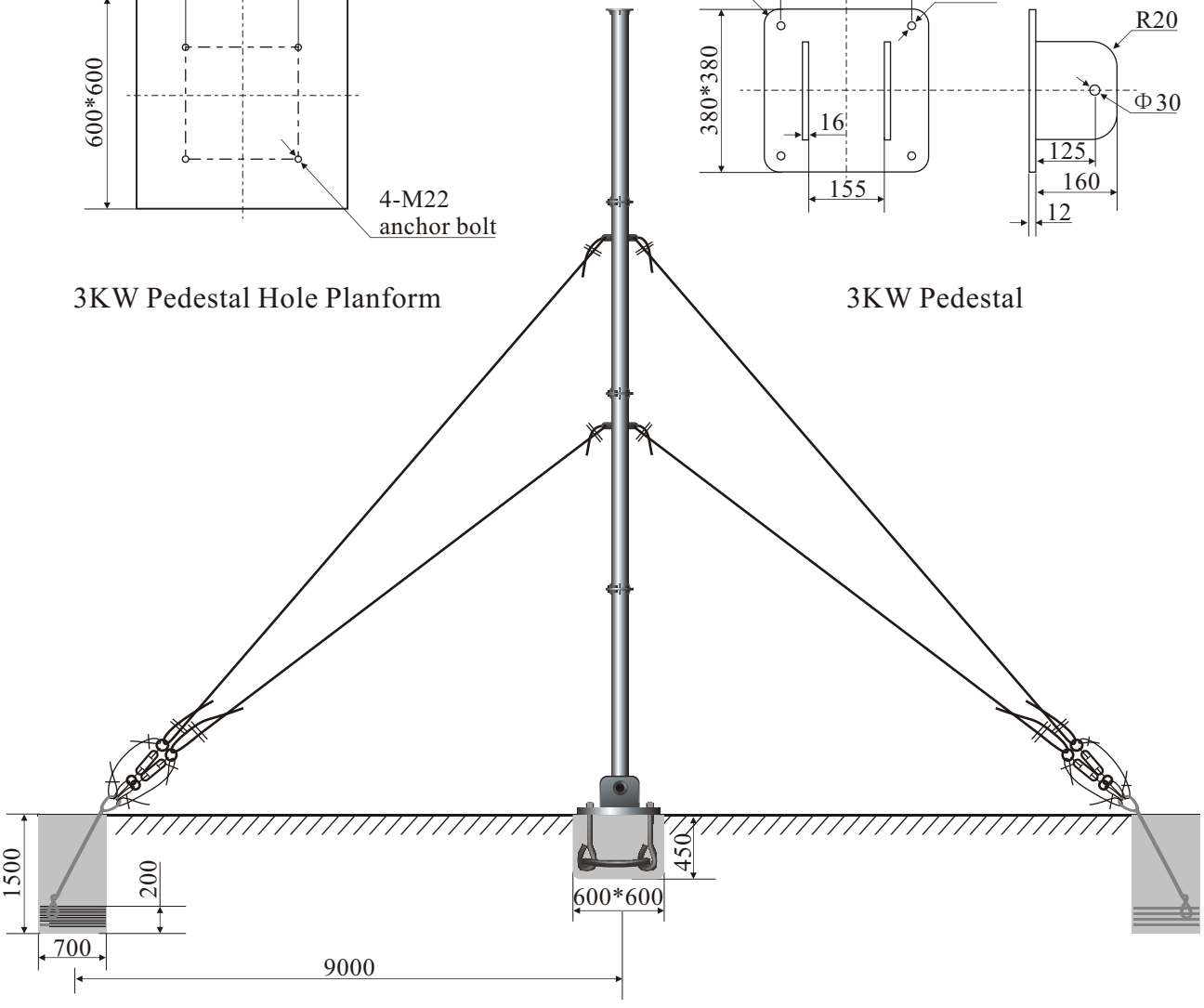
Pre-make one tower pedestal and four guy pedestals by concrete (C25).
Size of the concrete of tower pedestal: 600×600×450 mm (L*W*H)
Size of the concrete of guy pedestal: 700×400×200mm (L*W*H)
Size of tower pedestal: 380×380×12mm (L*W*H)



3KW Pedestal Hole Planform



3KW Pedestal



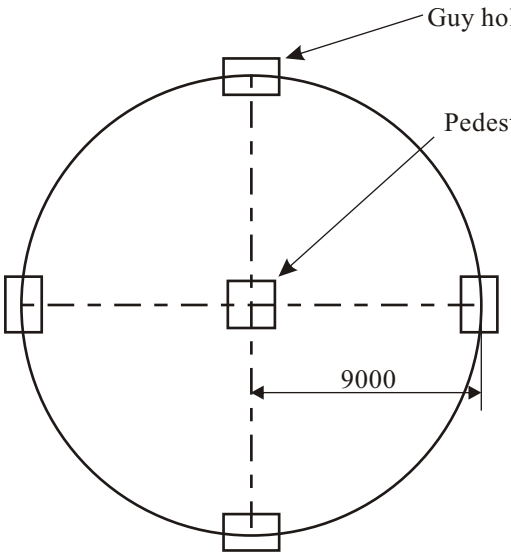
HUMMER-3KW Anchor Installation

CAUTION:

The fixed loops on guy pedestals and the connecting rods shall be made of stainless steel. Ordinary steel can be used only after special anticorrosion treatment, such as Hot Galvanizing.

9.2.2 Digging the Hole

Dig the hole refer to the given size, then put the tower pedestal & guy pedestals inside the hole, at last level up the ground. The fixed loop on guy pedestal should be exposed.



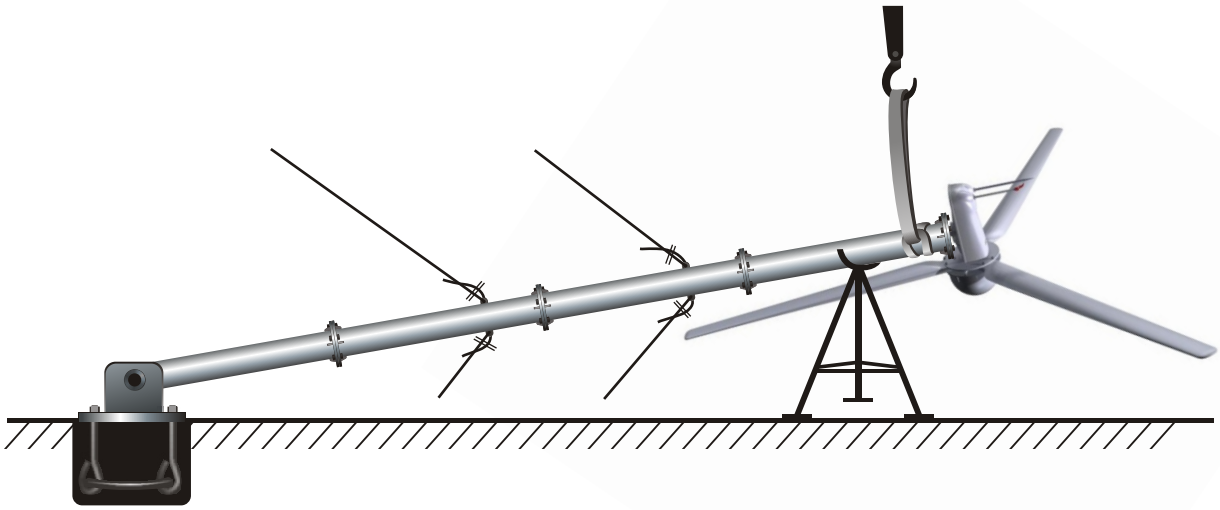
Guy hole: 700*400*1500（L*W*H）
Pedestal hole: 600*600*450（L*W*H）
Center distance between guy hole
and pedestal hole: 9000
Unit: mm

9.3 Assembling

Assembling is the same as steps of assembling wireless tower system.
(Please refer to the part of the wireless tower assembling procedures in this manual.)

9.4 Erecting the Wind Generator

Suggested method: Use the crane
Fasten the steel wire on the crane with the top of the tower and tighten it. Slowly lift the crane arm and erect the whole generator until the tower is vertical to the ground. Hold the position of the crane and fasten the steel wire around, then tighten each guy one by one, and make the tower vertical to the ground.



HUMMER-3KW Guy Tower Erection Picture

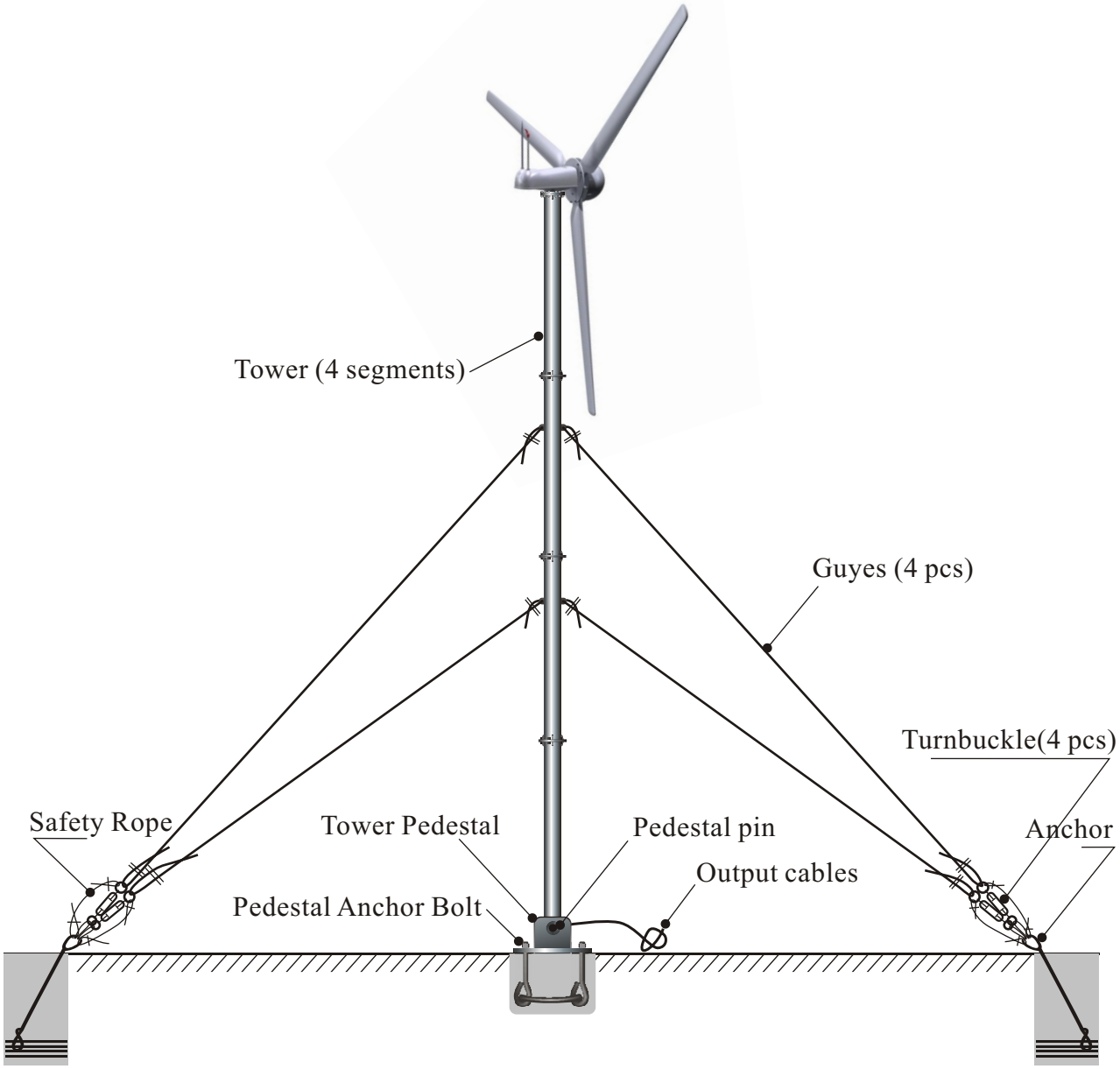
CAUTION:

I. It is important for you to consult a local specialized tower installation technician, who has electric tower or outdoor billboard erection experience.

II. Make sure the two cables from the wind generator are short circuited connected in order to avoid blades rotation during the process of erecting.

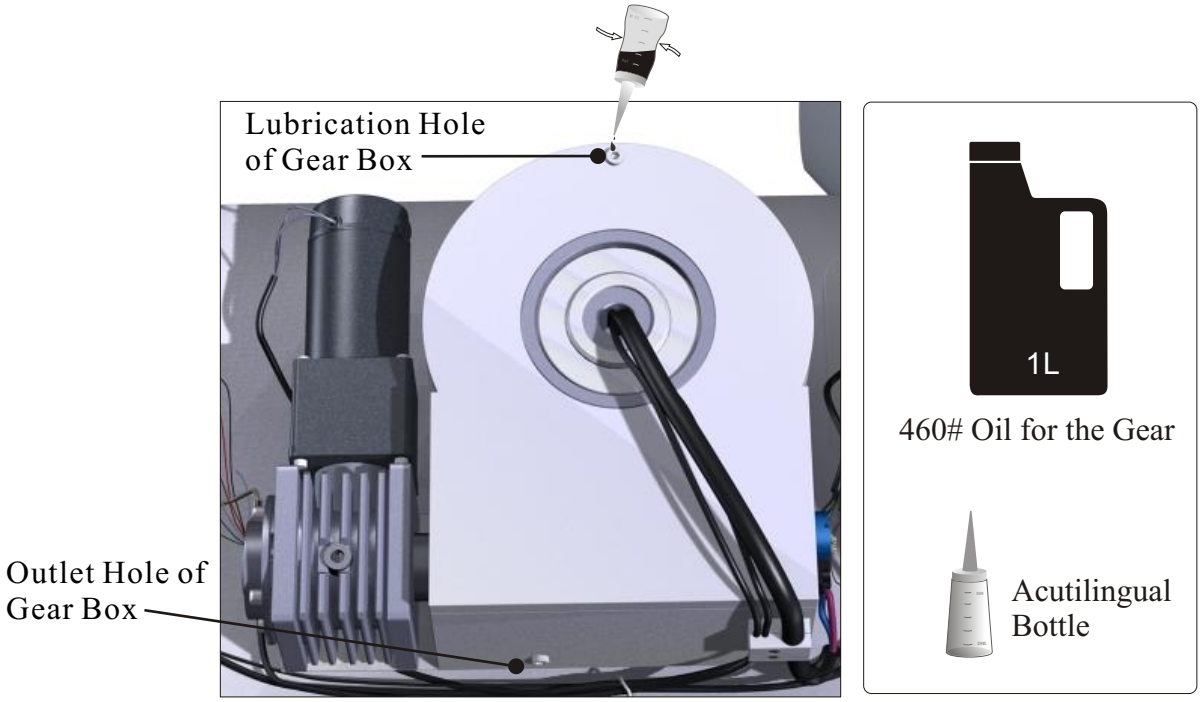
III. The joint point of each steel wire and guy ring should be insured with safety lock to avoid the loose of turnbuckle during the adjustment.

IV. Safety shall be first concern in the process of erection and adjusting, be careful of tower falling, which would endanger the safety of the field workers.



HUMMER-3KW Diagram of Guy Tower Connection

10. Assembly Precautions



10.1. The ideal distance between 2 sets of 3KW wind generator is 20m.

10.2. When a product is to be assembled, open the cover of the gear box lubrication hole and about 0.5L engine oil should be inputted with the acutilingual bottle.

CAUTION: The 460# oil is special for the gear, can not be used as speed-reducer of direction-regulating motor oil, or other equipment oil.

CAUTION: Oil used for speed-reducer is 46# hydraulic oil which has been filled before they leave factory.

10.3. Make sure the two output cables of the generator are short circuit connected to avoid blades rotation during the process of tower erection.(if the wind speed is too fast during the tower erection, the blade will rotating slowly, the wind speed would better be slower than 10m/s when installing.)

10.4. Make sure the tower must be vertical to the ground. If the tower is not vertical but tilt to one side, the extra energy will be consumed by the direction-regulating motor when working.

10.5. Please evaluate the length of wire rope before erecting the tower. Every connection point of turnbuckle is fitted with twist lock to prevent tower falling down because of turnbuckle looseness.

10.6. Any group blades are made up with 3 blades which have passed the rigorous test of balance and can not be exchanged between two different generators, otherwise the blades will run abnormally which will result in serious shaking.
Open the packing box with extreme caution to avoid any disorderly taking the blades.

10.7. For off grid system, the power generated by wind generator will charge batteries after rectified, different model collocates different numbers of batteries, please strictly follow the user's manual to choose the right number to make sure the output voltage of wind generator will well matched with the voltage of batteries. If batteries' voltage is too high or too low, the generator system may work improperly or some parts of the system could be burn out.

10.8. Emergency Shut-down

Please use the "Manual mode" function to set the control model to "Manual track",press the "Manual stop" button to drive the yaw shaft to deflect 90º to let the blades parallel to wind direction, before typhoon or gale(such as more than grade 10) coming. Then put the "wind generator stop/operation switch" to the "Stop" position. The wind generator will stop work. After the heavy wind, please put the "wind generator stop/operation switch" to the "Operation" position, and switch the "Manual mode" into "Auto mode", the wind generator will work normally.

CAUTION:

The "wind generator stop/operation switch" only can be switched from "Operation" to "Stop" when the blades stop rotating or rotate at very low speed. If switch when the blades rotating at a very high speed, it will cause a big shock to the wind generator or burn the generator.

10.9. The Connection of the Batteries

HUMMER-3KW wind generator is matched with 15 PCS batteries (12V, 150AH or 200AH).
Firstly, connect the 15 PCS batteries in series.
Secondly, connect the batteries to inverter. Please connect the battery anode (+) and cathode (−) strictly to the inverter anode (+), the cathode (−) terminals.

CAUTION: Please charge the new battery with state grid prior to using.

11. Troubleshooting

Problems	Possible Cause	Solution
Blades can't turn steadily, shake a lot	Unbalance of the blades	Check whether misuse the blades which are not belonging to same unit.
Good wind, but blades rotate very slowly	1. The two output cables are short circuited 2. Generator was burnt out	1. Check whether the two output cable are short circuited. 2. Change the generator.
Blades rotate faster than usual	Generator lost load	Check whether the output cables are broken and fuses are melted down or not. Get the output cables and fuses reconnected.

12. Daily Maintenance

The HUMMER wind turbine is highly reliable and does not need frequent maintenance. However, the overall system of wind turbine must be inspected and maintained regularly to ensure the system's normal operation.

12.1. Guy Inspection

Check the tower guys for loosening and fasten any loosened wiring timely. Carry out this inspection time after time in the first three months after tower erection. It is also necessary to check wiring after gales.

12.2. Screw Inspection

Check and fasten the screws on flange, yaw shaft and tower. This work should be done every year.

12.3. The lubrication in the gear box has to be renewed biennially.

12.4. Transmission Line Inspection

Check whether the connecting points of the cables are well-connected or corroded.

12.5. Battery Maintenance

Regularly check and maintain the batteries bank as per the maintenance requirements of the batteries. If there is no wind for a long time, don't have the batteries in electric deficit state too long. Charge it with grid power in time.

CAUTION:

Do not stand near the turbine during gale weather. It is recommended that you lay down the tower or bind blades with tower in the case of approaching extremely rough weather (such as typhoons, hurricanes, etc) to avoid accidents.

13. Safety Precautions

HUMMER wind generator is designed under strict safety regulations.
However, any electrical and/or mechanical equipment during installation or operation can cause potential inherent dangers, if the proper safety precautions are not taken. Please read the following safety precautions thoroughly before you choose the wind generatorlocation, plan to install or operate the turbine.

13.1. Mechanical Hazards

Rotating blades can move fast enough that the tip of a blade is almost invisible, which can cause serious injury or damage to anything it contacts. Do not install the turbine where anyone can come in contact with the blades.

13.2. Electrical Hazards

- The product is equipped with needed protection device to avoid electrical dangers. But potential dangers still exist in the turbine, so please be careful during the process of connecting wires and other electronic equipments.

- Undersized wire or a bad connection can cause over-current electrical dangers and overheating in wiring systems which could cause fire or other personal dangers. Thus it is important to check the wire connections in normal maintenance.

- Please strictly follow the manual when you operate the inverter.

- Fire will be caused by the short circuit of batteries. In order to avoid this threat, please make sure the fuses are in a good condition.

13.3. Assembly Hazards

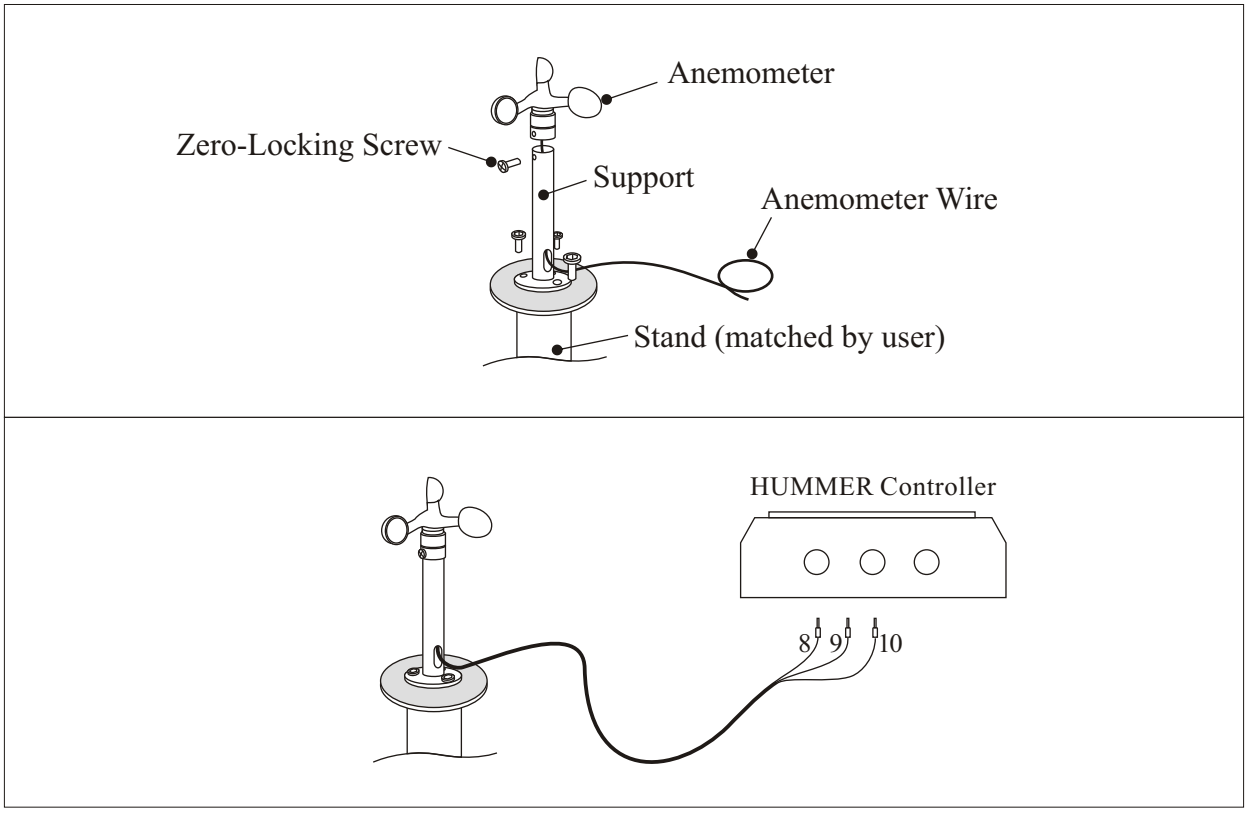
Safety should be first concern.

14. Annex: Assembling of the Anemometer

14.1. Please refer to the steps of the dogvane assembling. Pull the anemometer cable through the support first and then fasten the anemometer to the support with a screw.

14.2. Settle the anemometer support to a place near to the wind generator and can correctly detect wind speed. Or assemble anemometer onto a stand. Make sure that the anemometer should be in same height with the wind generator. This can ensure the wind speed data that anemometer send to the wind generator controller is correct.

14.3. Anemometer Connecting Wire is 30m



Part II

Wind Generator Control System

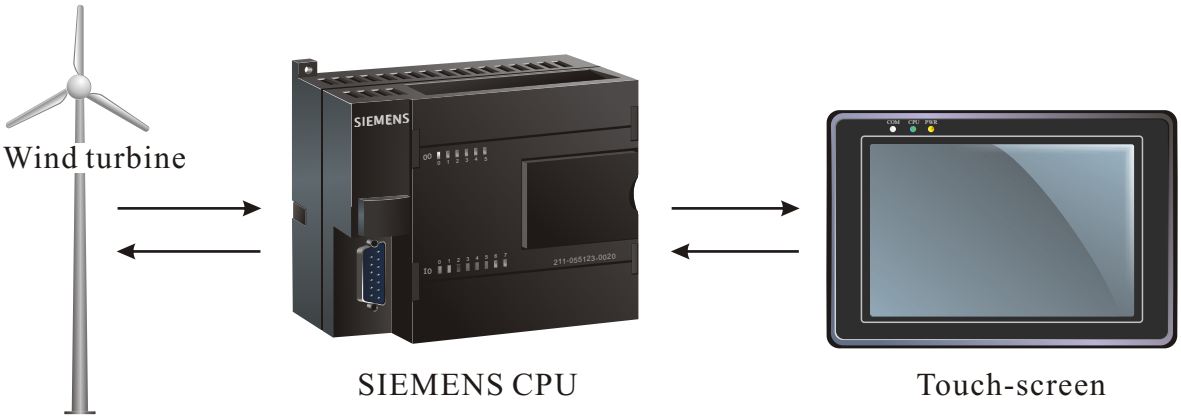
HUMMER wind generator control system mainly used to control the DC24V direction-regulating motor, which drives yaw shaft deviate to seek wind direction, thus to make sure the wind generator make use of the wind energy efficiently.

1. The Introduction of Control System

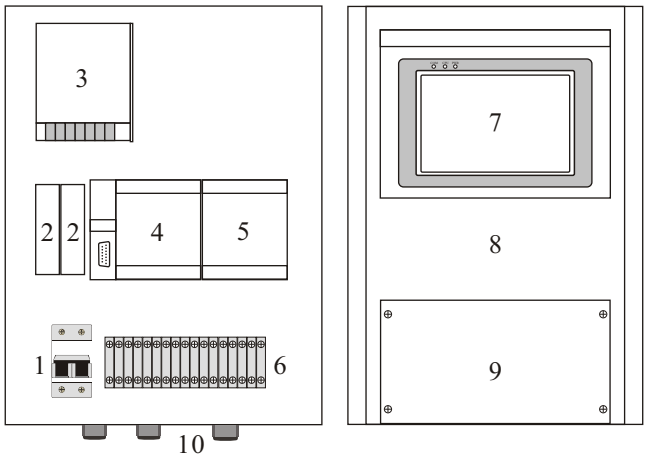
The system adopts SIEMENS CPU and touch-screen control, which will alarm and adjust the running status of the wind generator automatically and protect the wind generator promptly when there are abnormal situations during the operation of the wind generator. Thus it is much easier and more reliable for user to monitor the operation of wind generator.

HUMMER wind generator control system is capable of quick reaction to wind signal in wind site, monitoring and adjusting the operation of wind generator accordingly.
The user can view various of operation data of the wind generator on the touch-screen LCD; and manual control the wind generator to fulfill the function of manual seek wind, manual stop and forced start-up etc. through the touch-screen,(Detailed functions, refer to 5.5)

HUMMER controller is designed basing on more human-oriented, and contains the "User Parameter Setting" interface. Users can set the start-up wind speed under the mode of "seek the wind direction automatically",and the protect wind speed for deflection in heavy wind according to the actual needs.
The whole wind generator control system can be simplified as the following Figure.



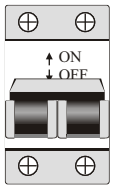
2. The Specific Structure of HUMMER Wind Generator Controller



1	Power Switch
2	Fuse Tube AC500V/4A
3	DC24V Power SupplyI
4	SIEMENS CPU
5	SIEMENS Extension Module
6	Terminal Block
7	Touch Screen
8	Upper Cover of Controller
9	Terminal Block Cover
10	Wire Inlet Hole

3. Switch and Terminal Blocks of the Controller

3.1. Power Switch

	I. Grid-tied	L	Connect to State-grid L(AC180~260V)
		N	Connect to State-grid N
	II. Off-grid	+	Connect to Anode(+) of Battery Bank
		−	Connect to Cathode(−) of Battery Bank

3.2. Terminal Blocks

⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕
L	N	PE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	⊕	

High Voltage Power Supply Wire	L		DC24V power supply II(on the yaw shaft), L
	N		DC24V power supply II(on the yaw shaft), N
⏚		PE	GND
Generator Signal Wire	1	V−	DC24V-
	2	Q0.0	Yaw shaft contra rotation signal
	3	Q0.1	Yaw shaft clockwise rotation signal
	4	I0.0	Generator rotation speed signal
	5	I0.2	Yaw shaft angle signal
	6	200	Wind direction signal
	7	202	Generator temperature signal
Anemometer Wire	8	V+	DC24V+
	9	V−	DC24V-
	10	I0.1	Anemometer signal
Signal wire for Rectifier & Dumping controller	11	V+	DC24V+
	12	V−	DC24V-
	13	204	Voltage signal
	14	206	Current signal
UPS Wire	15	V+	DC24V+
	16	I0.3	UPS signal

4. Connection of Generator and Control System

4.1. Assembling Steps for HUMMER Controller and Wind Generator Connection

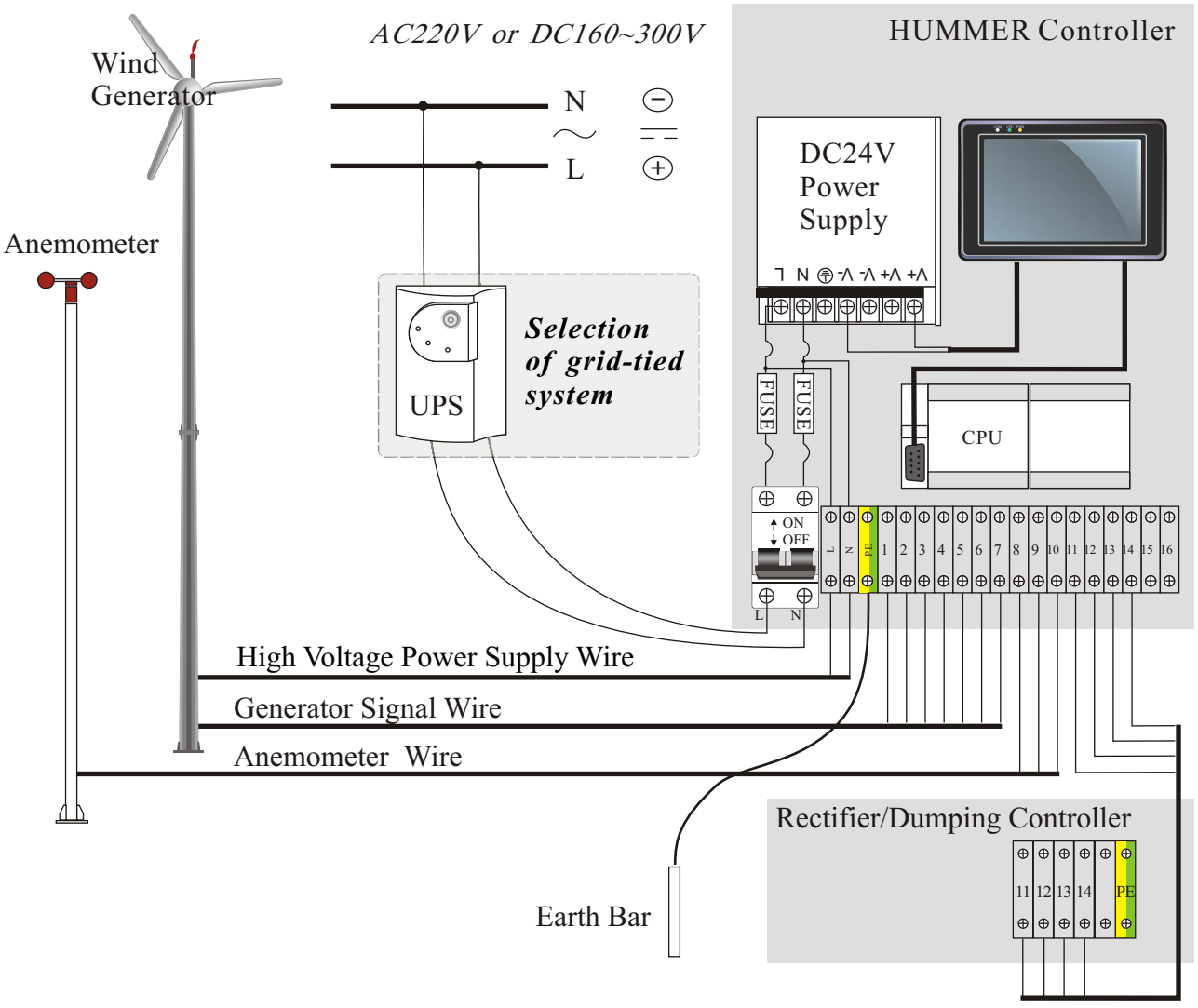
Step 1: Take off the terminal block cover, separately connect the generator signal wires (1/2/3/4/5/6/7), Yaw shaft high voltage power supply cables (L/N), anemometer signal wires(8/9/10), and UPS signal wire (15/16, grid tied selection) to corresponding terminals on the controller.

Step 2: Put the "Power switch" at "OFF" position, and then connect the high voltage power supply wire to it.

- Off grid system: Connect the batteries anode (+) to "DC input +", cathode (+) to "DC input -".
- Grid tied system: Connect State-grid "L/N" separately to the "AC input L/N" switch ports.

Step 3: Put the "Power switch" in the position of "ON".

4.2. Control System Connection Diagram



CAUTION:

User should make HUMMER controller reliably grounding. Grounding wire should be not less than 1.5 mm². User can choose to connect the grounding bar to the ground or to the city grid GND terminal. Only after the HUMMER controller was reliably grounding, can you go on the above connection procedure.

Annex: Pictures for all the Wires Connect to the Controller

High Voltage Power Supply Wire	Generator Signal Wire	Anemometer Wire	UPS Output Wire

4.3. Power Supply for the Controller

4.3.1. HUMMER controller can be used for both grid-tied system and off-grid system.

● When used in grid-tied system, power supply is from grid. Voltage range is AC180V ~ AC260V, 50Hz or 60Hz.

● When is used in off-grid system, the power supply from batteries, voltage range is DC 160V~300V.

4.3.2. After connecting in the power switch, the High voltage power supply will be divided into two paths:

● One connects to the DC24V power supply I on the controller, and be converted to 24V DC and supply power for SIEMENS CPU.

● The other connects to the DC24V power supply II on the yaw shaft. And then supply power for the direction-regulating motor through the relay (KA1, KA2). This can avoid the voltage reduction problem for direction-regulating motor power supply which owes to long wire distance.

4.3.3. User can control the power supply for the controller freely by using the switch on the controller. Please put this switch on the "OFF" position before connecting the power supply wire and signal wires. Put the switch on the position of "ON" after connection.

4.4. UPS Connect in (Selection of Grid-tied System).

For grid-tied wind generator system, when grid is off, the electricity generated by the generator only can be consumed by the dumping load. Meanwhile, as there is no power supply for the control system, it can't control the yaw shaft to turn away from the wind direction. UPS can be a good choice for the user.

4.4.1. UPS function for grid-tied system: When grid running normally, grid supply power to the control system directly. When grid is off, UPS will invert and output power to control system and send signals to SIMENS CPU. CPU will order the yaw shaft to turn 90° to make the generator stop working. After the grid being restored, as the grid supplies electricity for the control system again, UPS will stop inverting but send signal to CPU, Then CPU will make order asking the system searching for wind again and turn into normal working condition.

4.4.2. UPS Connect Steps:

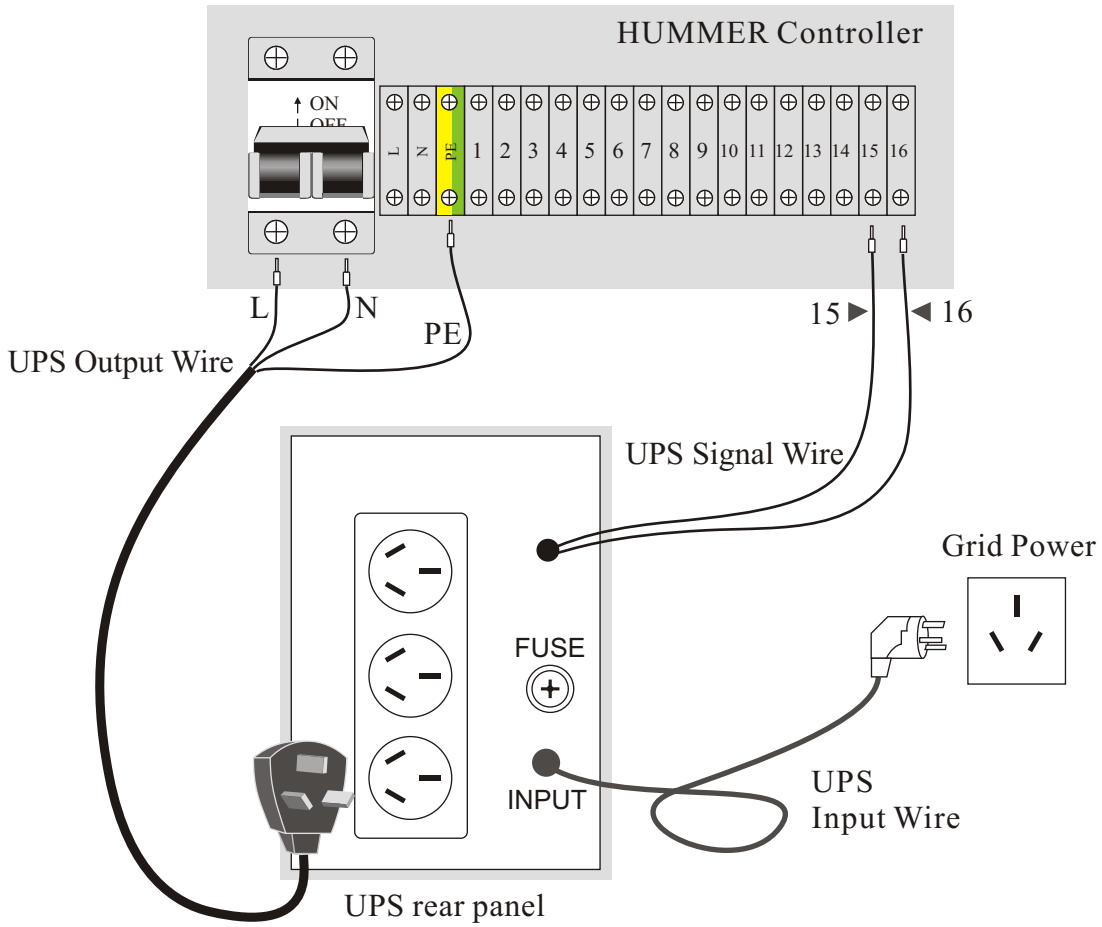
Step 1: Connect the UPS output cables (PE/L/N) to the corresponding terminals (PE/L/N) on the controller. And then plug it into the power supply socket at the UPS rear panel.

Step 2: Connect the signal wires at the rear panel of UPS (15/16) to the corresponding terminals on the controller.

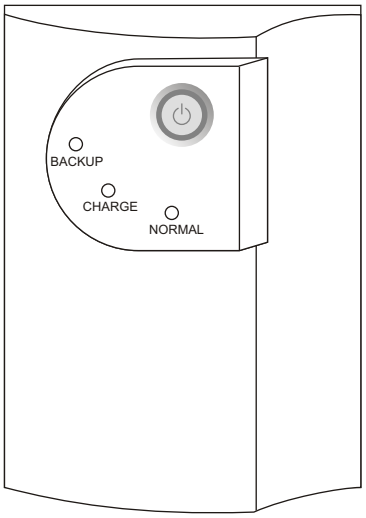
Step 3: Connect the UPS input power supply plug to the local grid, input voltage is AC 180V~AC 260V.

Step 4: Switch on the power switch at the front panel of UPS。

4.4.3. UPS and System Connection Diagram



4.4.4. Indicators for the Working Status of UPS



Indicators	Buzzer	UPS situation
Green(NORMAL)	No	Grid supply power normally
Yellow(CHARGE)	No	UPS batteries charging normally
Red(BACKUP)	intermittent screaming	Grid abnormal(blackout, abnormal voltage), UPS supply power.

4.4.5. UPS Technical Parameters

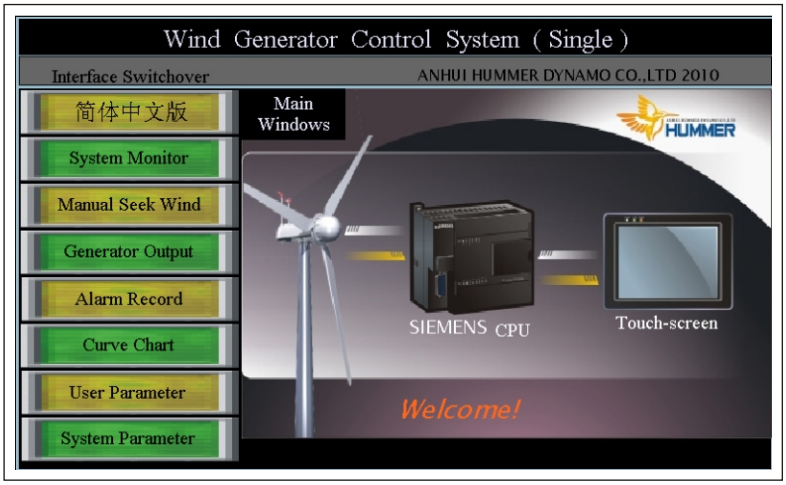
Model	K-500	K-1000
Net weight	5.5Kg	13.0Kg
Input voltage	220V AC ±25%	
Output voltage	220V AC ±10% (Under the mode of battery)	
Output frequency	50Hz~100Hz (Under the mode of battery)	
Exchange time	⩽10ms	
Spare time	3~20 minutes (half load)	
Charging time	10~16 hours	
Operation environment	Temperature: 0 ~ 40°C， Humidity: 20% ~90%	

5. The Display and Operation of the Touch Screen

5.1. Startup Interface

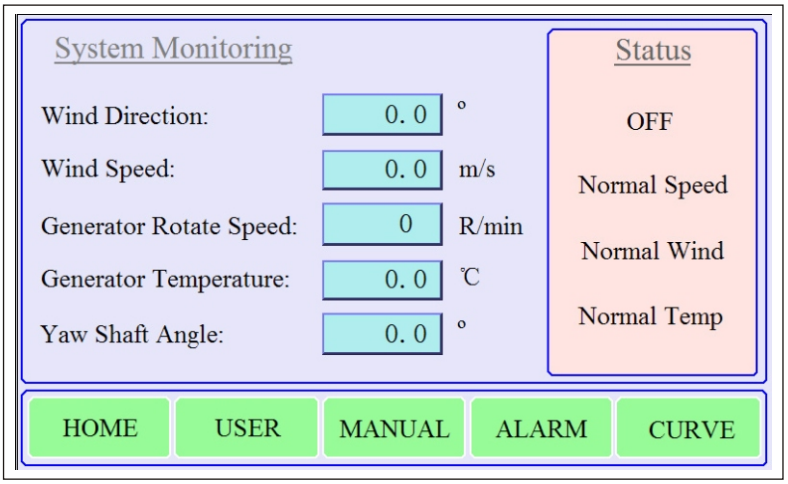
After the controller connecting to the power supply,the touch-screen turns into the start-up interface of the “Wind Generator Controlling System”. Users can choose the language version,Chinese or English.

- in the Chinese user interface, users can click on the “English” to enter English interface
- in the English user interface, users can click on the “中文版” to enter Chinese interface



5.2. System Monitoring

Click the “System Monitor” to enter the following interface, and then click the “HOME” to back.



Wind Direction:
The timely angle between the dogvane direction and the axis of yaw shaft（°）
Wind Speed:
The timely wind speed, actual measurement in the wind site by the anemometer (m/s)

Generator Rotate Speed:
Number of rotations per minute of generator (rpm)
Generator Temperature:
The timely temperature of generator (°C)

Yaw Shaft Angle:
The current angle of the yaw shaft（°）

5.3. Status Indicator

5.3.1.ON/OFF
"ON" indicates the yaw shaft is in an "Auto mode",it seeks the wind direction automatically, "OFF" indicates the generator is in a stopped status, not track the wind direction.

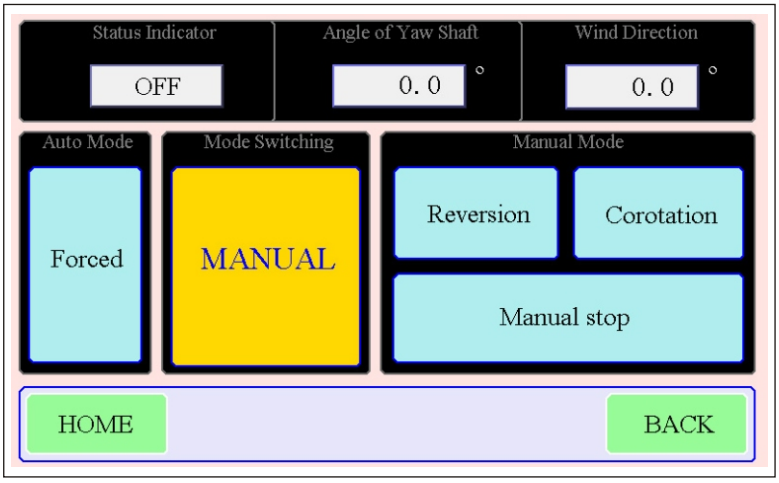
5.3.2. Over Speed/ Normal Speed
It indicates whether the generator rotating rate is over speed or not.

5.3.3. Normal Wind Speed /Wind Speed Exceeded
It indicates whether the wind speed data measured by anemometer is over the set top limit or not

5.3.4. Normal Temperature /Over Temperature
It indicates whether the temperature of the generator is over the top limit or not.

5.4. Manual Seek Wind

Click the "Manual Seek Wind", the system will enter the manual seek wind mode operation interface.



5.4.1. Mode Switching:
Being switched between the "MANUAL" mode and the "AUTO" mode.

5.4.2. Manual Mode:
After selecting the "MANUAL" mode, user can control the yaw shaft to rotate freely in the range -270 º ~ +270 º, it can rotate 540º totally.
In the "MANUAL" mode, the following operations could be down, (Meanwhile, indicator shows "Off")

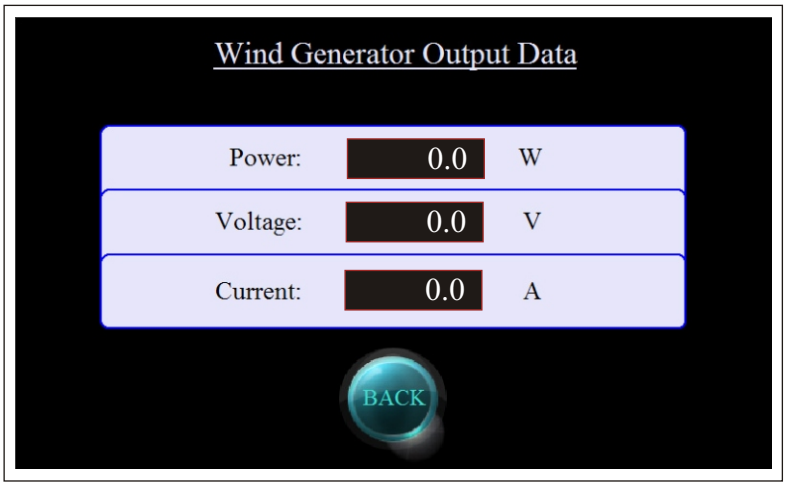
- Keeping on clicking the “Reversion”, Yaw shaft make counterclockwise rotation. The positive angle keeping increasing, when release, the yaw shaft shop rotating.
- Keeping on press the “Corotation” button, Yaw shaft make clockwise rotation.The negative angle keeping increasing, when release, the yaw shaft shop rotating.
- After click the “Manual stop”, the CPU orders the yaw shaft to deflect 90° from the current wind direction to stop the wind generator. Then click the “Manual stop” again, the yaw shaft will stop deflecting. To let the generator resume facing wind, please switch the “MANUAL” mode to “AUTO” mode.

5.4.3. Auto Mode:

After switch to the “AUTO” mode, CPU will control the yaw shaft to corotation or reversion, seek wind direction or stop the running system according the system programme.
In the “AUTO” mode, click the “Forced”, even the wind speed and other nature conditions do not satisfy the demand of system, it can force start-up the DC 24V Regulating-direction Motor to drive the yaw shaft to seek wind direction. (Meanwhile, indicator shows “On”).

5.5. Generator Output

In the start-up interface, click the “Generator Output”, the system will enter the following interface.



Voltage: The DC voltage that is output from wind generator by rectifier.
For off-grid system, this voltage is voltage of the battery bank. (V)
Current: Output current from wind generator. (A)
Power: The output power from wind generator. (W)

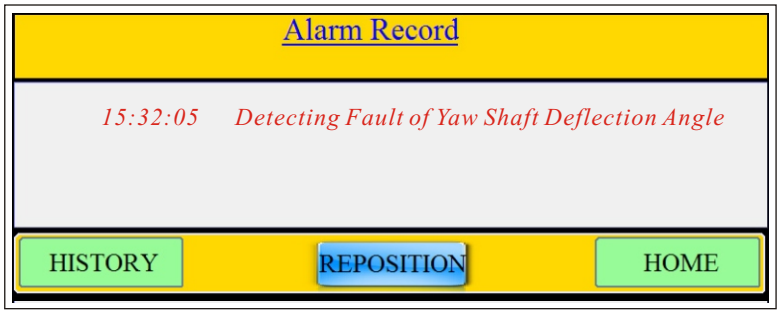
5.6. Alarm Record

When there are abnormal situations such as “Over Temperature, Over Speed, Wind Speed Exceeded”, or “Detecting Fault of Yaw Shaft Deflection Angle”, the system will record them.
Users can view this information in the alarm record window by click the “Alarm Record” in the start-up interface.

Alarm History: The system can store 500 PCS previous alarm records.

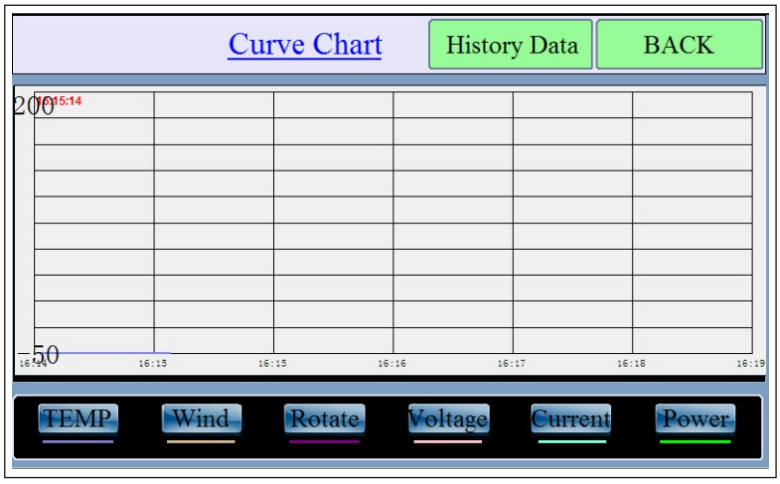
Alarm Reposition: When the alarm window shows“ Detecting Fault of Yaw Shaft Deflection Angle”, users must use the “ Reposition ” to reset, then the generator can running normally under the “AUTO” mode. The possible reasons for this are as following two:

- Strong wind, yaw shaft is blocked to rotate, and then the CPU can not get yaw shaft rotation signals long-timely.
- The angle transducer which monitoring yaw shaft rotation angle is out of work, to avoid the yaw shaft keep rotating and cause the cables damaged due to twisting. So the CPU makes an alarm and stops the wind generator.



5.7. Curve Chart

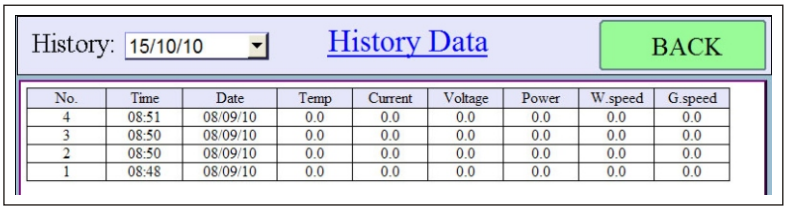
Click the “Curve Chart” to view the working curve of the generator.



Temperature Curve: After click the “TEMP”, the curve reflects the temperature changing tendency of generator timely.
Wind speed Curve: After click the “Wind”, the curve reflects the changing tendency of wind speed measured by anemometer timely.
Rotate speed Curve: After click the “Rotate”, the curve reflects the current rotate speed changing tendency of generator.

Voltage Curve:
Click the “Voltage”, the curve reflects the current voltage changing tendency of generator.
Current Curve:
Click the “Current”, the curve reflects the current current changing tendency of generator.
Power Curve: Click the “Power”, the curve reflects the current output power changing tendency of generator.

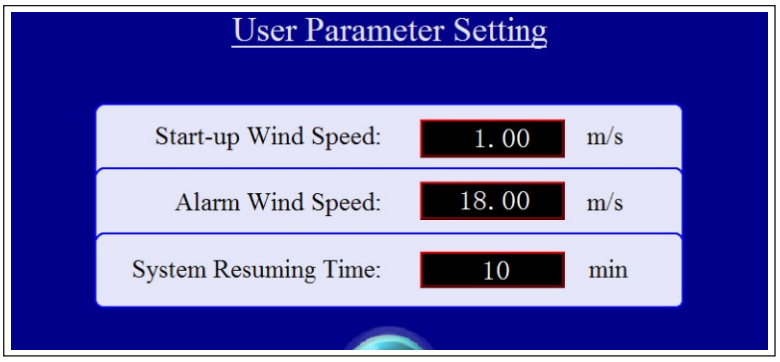
History Data: Click the "History Data", LCD will switch to history record interfaces for various data within a week .(as shown in the following picture)



No.	Time	Date	Temp	Current	Voltage	Power	W.speed	G.speed
4	08:51	08/09/10	0.0	0.0	0.0	0.0	0.0	0.0
3	08:50	08/09/10	0.0	0.0	0.0	0.0	0.0	0.0
2	08:50	08/09/10	0.0	0.0	0.0	0.0	0.0	0.0
1	08:48	08/09/10	0.0	0.0	0.0	0.0	0.0	0.0

5.8. User Parameter Setting

Click "User Parameter" in the home page, the system will switch to "User Parameter Setting" interface. User can reset the following parameters according to the actual need .



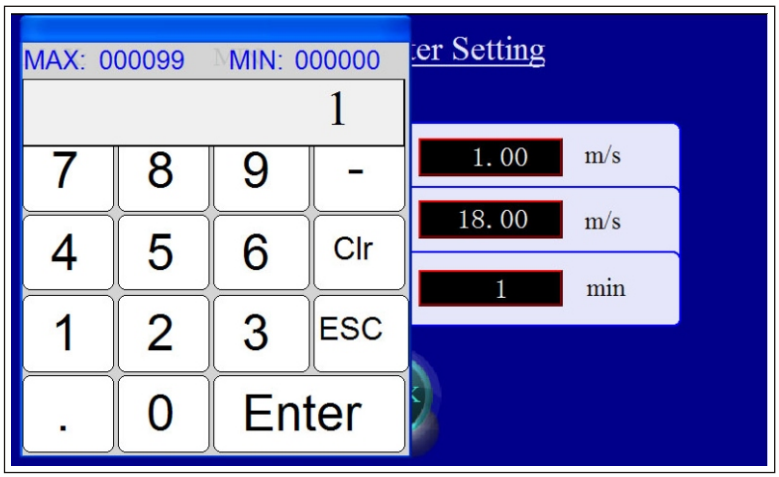
Start-up Wind Speed: The start-up wind speed should be set according to local climate and actual needs(m/s). Under "Auto" mode, when the wind speed measured by the anemometer reaches to the set Start-up Wind Speed, CPU will order wind generator to face wind.

Alarm Wind Speed: The protect wind speed (m/s) for the yaw shaft turning to protect the system.

System Resuming Time: The system resuming time is the time period that the normal wind speed lasts and then the system can re-search wind and resume working after the stop due to over wind speed alarm.

To protect wind generator in extreme weather, we specially set over wind speed protection program, this program can effectively protect wind generator from being damaged in heavy wind.Default set system protection wind speed is 18m/s, system resuming time is 10 Min. (User can also set these parameters voluntarily).
When wind speed is over 18m/s, Yaw shaft will deflect 90° to let the blades parallel to wind direction and the wind generator will stop working. Meanwhile, the timer starts timing.
● If wind speed is continuously lower than 18m/s for 10 min, System will re-search wind and resume to work.
● If wind speed is over 18m/s when the timer times to the 8th min, the timer will resume to 0, and restart. Only the wind speed keeps lower than 18m/s within the set system resuming time (10 min), can the system re-search and face wind.

The Method to Setting Parameters:
Click the corresponding data display area, numeric keyboard will pop-up in the screen, users can input data by the touch control way, using the "CLR" to clear data, using the "ESC" to exit ,using the "Enter " to confirm the input data and exit.



5.9. System Data Setting

This setting is only for manufacturers to debugging with password protection, and no user interface provided.
In the start-up interface, click the “System Parameter”, screen will pop-up the password input dialog box, click “CANCEL” to return to the previous interface.

6. System Time Setting

At the lower right corner of the touch-screen, there is an icon “ ”, click it, a toolbar comes out. Select the icon “ ”, then a “system setting” dialog box comes up.
Input the password, which is initially set as “ 111 111 ” at the factory, then select “ Time / Date” tab to set the current time and date.

7. Precautions for Operating the Controller

HUMMER controller demands the grid input parameter ranges in AC180V~AC260V, 50Hz or 60Hz. (DC power supply could also be used, the required voltage range of it is DC160V~DC300V.) Too high input voltage may cause the damage to the important unit of the controller.

8. Troubleshooting for HUMMER controller

Problem	Possible Cause	Solution
Generator can't face wind automatically	1.Under "MANUAL" mode. 2. Wind speed is too low. 3. System start-up wind speed was set too high. 4. The DC24V power supply II is broken down. 5. Dogvane angle transducer is broken down.	1. Change to "AUTO" mode. 2. Wait till have higher wind speed. 3. Change start-up wind speed under "User parameter" interface. 4. Change the DC24V power supply on the yaw shaft. 5. Change the dogvane.
Fuses in controller are burnt out.	There is short circuit on	Check the high voltage power supply part, especially the DC 24V power supply on the yaw shaft and the connecting wire circuit. Replace the fuses after the problem was settled.
Anemometer rotates, but the wind speed on LCD is zero.	The transducer or the transferring wire of anemometer was broken down.	Change the anemometer transducer, check the anemometer signal wire.
Dogvane swings, but the wind direction angle is zero.	Fault on Dogvane transducer	Check the dogvane and the dogvane signal wire.
Alarm for "Detecting fault of Yaw shaft deflection angle". Keep alarming after the restoration.	The transducer which detects yaw shaft deflection angle is broken down.	Change the detecting transducer for yaw shaft deflection angle

Part III

Off-grid Wind Generator Output System

Off-grid rectifier/dumping controller rectifies instable current generated by the generator into stable DC and charges the batteries under the control of IGBT. Then the off-grid inverter inverts the DC current from the batteries and supply to the electrical appliances.

Off-grid wind generator power output system is built by 5 parts: Generator, off-grid rectifier/dumping controller, batteries, off-grid inverter and dumping load.

In this unit, we only introduce the function of off-grid inverter, for the relevant function of the other equipments, please refer to the specific manual.

1. Panel Functions and Operation Instruction

1.1 Inverter Output Switch:
This switch is for starting the inverter. However, the inverter shall be restarted 5 seconds later after long standby time or after auto protection from the over discharge of battery.
1.2 Wind Generator Work Indicator:
No indicating

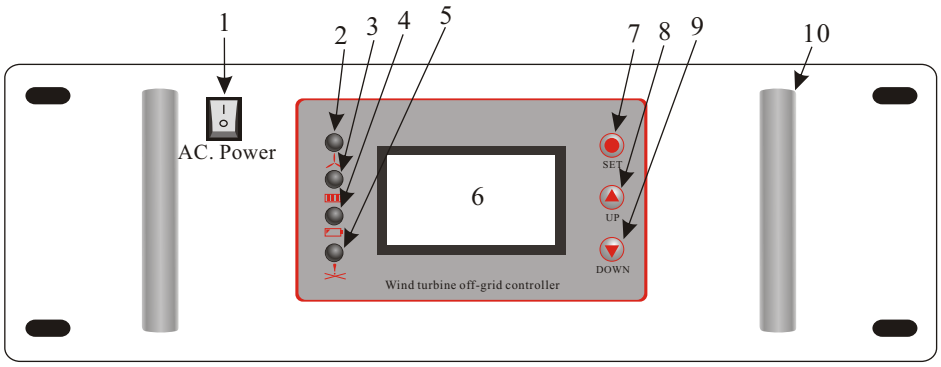
1.3 Overcharge Indicator:
When charging the batteries, and the voltage of the batteries is up to the "protect voltage" (15V/piece), the over charge indicator will flicker. At the same time wind generator will deflect 90° and stop working.
10 minutes later, when the battery voltage drops to the "recovery voltage" (13.5V/piece), the wind turbine will resume seeking present wind direction and recover to work.

1.4 Over Discharging Indicator:
When inverting, if the voltage of batteries drops to the "protection voltage" (10.5 V/piece), the inverter will stop working. The over discharging indicator will light up.
When the battery voltage rises up to the "recovery voltage" (11.5V/piece), restart the inverter manually and it will resume working, and then there will be AC output from the inverter.

1.5 Abnormal Indicator:
When fault happens, the indicator will light up. Also fault condition will be shown on the display screen. The buzzer will alarm every 5 seconds to show the fault.

1.6 Up "▲": Turn up
1.7 Set: Press "SET", User can set up related information.
1.8 Down "▼": Turn down

HUMMER-3KW Off-grid Inverter



1. Inverter output switch
2. Wind turbine operation indicator
3. Overcharge indicator
4. Over discharge indicator
5. Abnormal indicator
6. LCD display screen
7. Set
8. Up
9. Down
10. Handle

2. Precautions

2.1. Do not expose inverter to rain & humidity to decrease the dangers of fire and electric shock. Please use the inverter in a well ventilated place, which will help to dispel the heat.

2.2. To ensure the inverter can work stable and reliable in a long term. Do not put the inverter on textiles such as bed, sofa, and cloth for the better ventilation.

2.3. Cleaning

Please close the inverter before cleaning.Do not use any liquid detergents or spray cleanser. Soft clean cloth will be the perfect choice.

2.4. Heat Producer

This machine must be far from heat producers, such as heater, heat regulatorand any other heating products.

2.5. Wire

The power cables should be located at the place which can't be tramped, either can't be pressed by other things. The plug, socket, and power cables all need special protection.

2.6. Overload

Overload is not allowed. Also should be careful of cables extending and integrated socket. All of these can lead to fire or electric shock.

2.7. Stuff

Do not put anything inside the machine or it will cause short circuit, fire and electric shock.

2.8. Moisture

Any kind of liquid should be put far away from the machine.

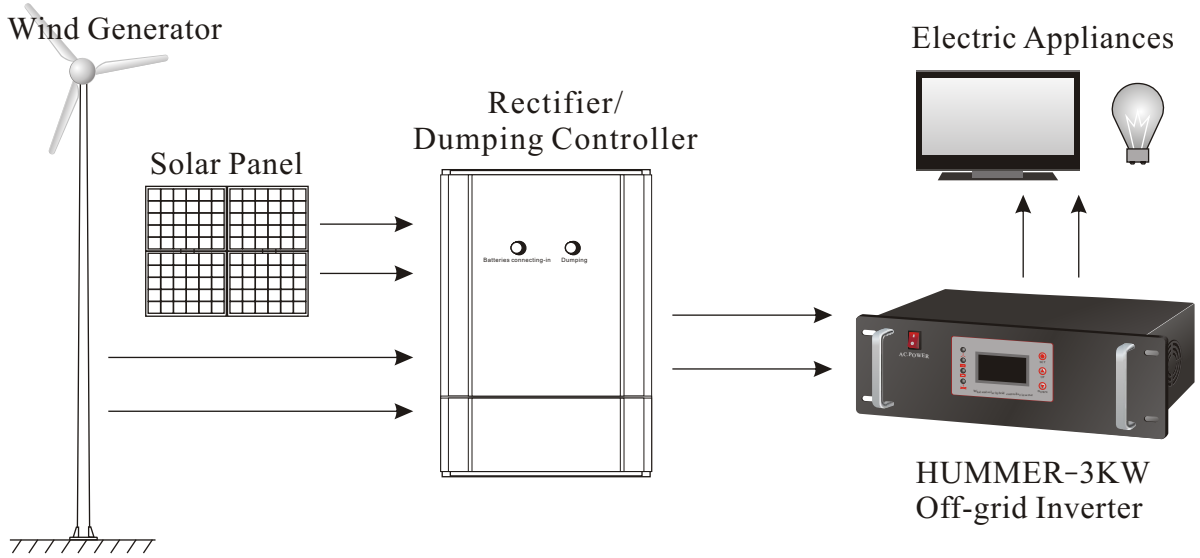
2.9. Repair

Any kind of repair by the end user is forbidden; please contact the authorized technicians for help.

3. Basic Information

The following picture shows the working of the entire wind generator system.
The power generated by wind generator will be stored in battery through control system. When inverter is switched on to supply power to loads, the inverter will take out power from battery, outputting pure sine wave AC. The rated output power is 3KW (resistance load).

Composition Picture of the Wind Turbine System



4. Inverter

4.1. Using CPU intelligent control technology, the control line response simply, reliably and rapidly to the external environment.

4.2. Using SPWM technology, output stable frequency, stable voltage, filter out noise, low distortion pure sine wave.

4.3. With using high frequency switch and amorphous transformer, the inverter has high with-load ability and good load capability.

4.4. Has the protection function of overload, over voltage, over current and over temperature. The CPU will turn off the inverter when there is no load for long time to protect the battery.

5. Operation of Inverter LCD

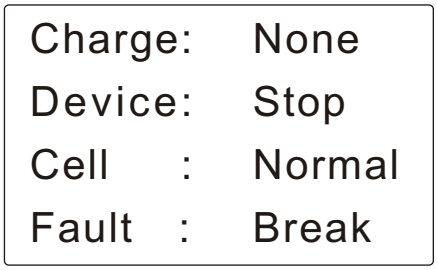
The off-grid inverter display screen has 5 groups of data. Because of the using of new HUMMER controller, we now only use part of the data shown. This manual will also only explain the relevant data. Screen 1 to 4 can be switched from one to another with the "▲, ▼" keys.

The switch method between screen 5 and screen 1,2 ,3 or 4 is:

When the current display screen is in the state of any one of screen 1 to 4, pressing "SET" key will be switched to screen 5.

While the current display screen is screen 5, pressing "▼" for 3 seconds will return to screen 1.

5.1. Display 1



Charge: None

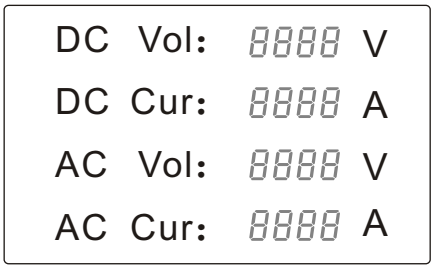
Device: Show "Normal" if turned on, show "Stop" if turned off.

Cell: Show "Normal" if batteries are not overcharged, or over discharged

Fault: Faults will show line by line. If over two faults happen, they will be displayed scrolling.

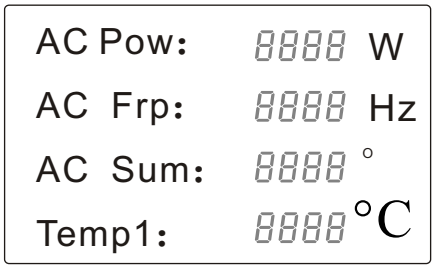
NOTE: Because generator control system is not in inverter, the inverter may still show "Comm Err". That will not effect the using.

5.2. Display 2



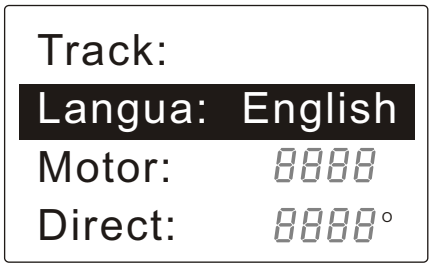
DC Voltage: Battery voltage（V）
DC Current: Charge current, and also the current summation of wind generator and solar panel (A)
AC Voltage: Inverter output voltage (V)
AC Current: Inverter output current (A)

5.3. Display 3



AC Power: Inverter output power（W）
AC Frequency: Inverter frequency（Hz）
AC Sum: Accumulative output quantity by inverter（D/KWH ）
Temp 1: radiator temperature of Inverter （°C）

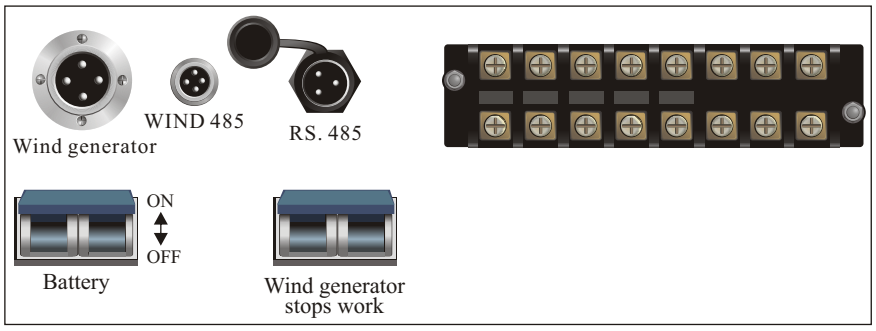
5.4. Display 5



Language: There are two languages,English and Chinese can be shown on display screen, Press "▲、▼" to choose language line,then press "SET" to choose the right part of this line, and press "▲、▼" to set Chinese or English. Finally press "SET" to confirm.

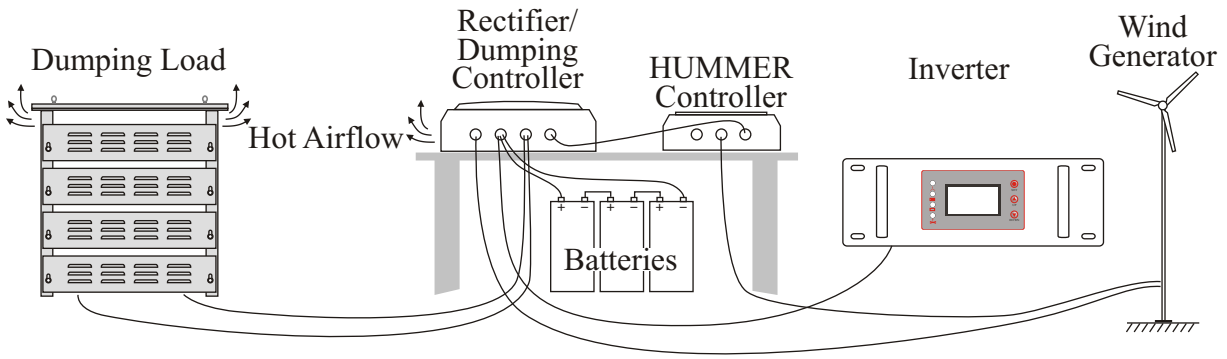
6. HUMMER-3KW Off-grid Inverter Rear Panel

CAUTION: We now only use the wire terminal block and the "Battery" switch of the inverter, all plugs and the "Wind generator stops work" switch of the inverter is no usage.



Battery switch:
When it is at "ON" position, the inverter outputs DC current to charger batteries, while when it is at "OFF" position, there are no DC output.

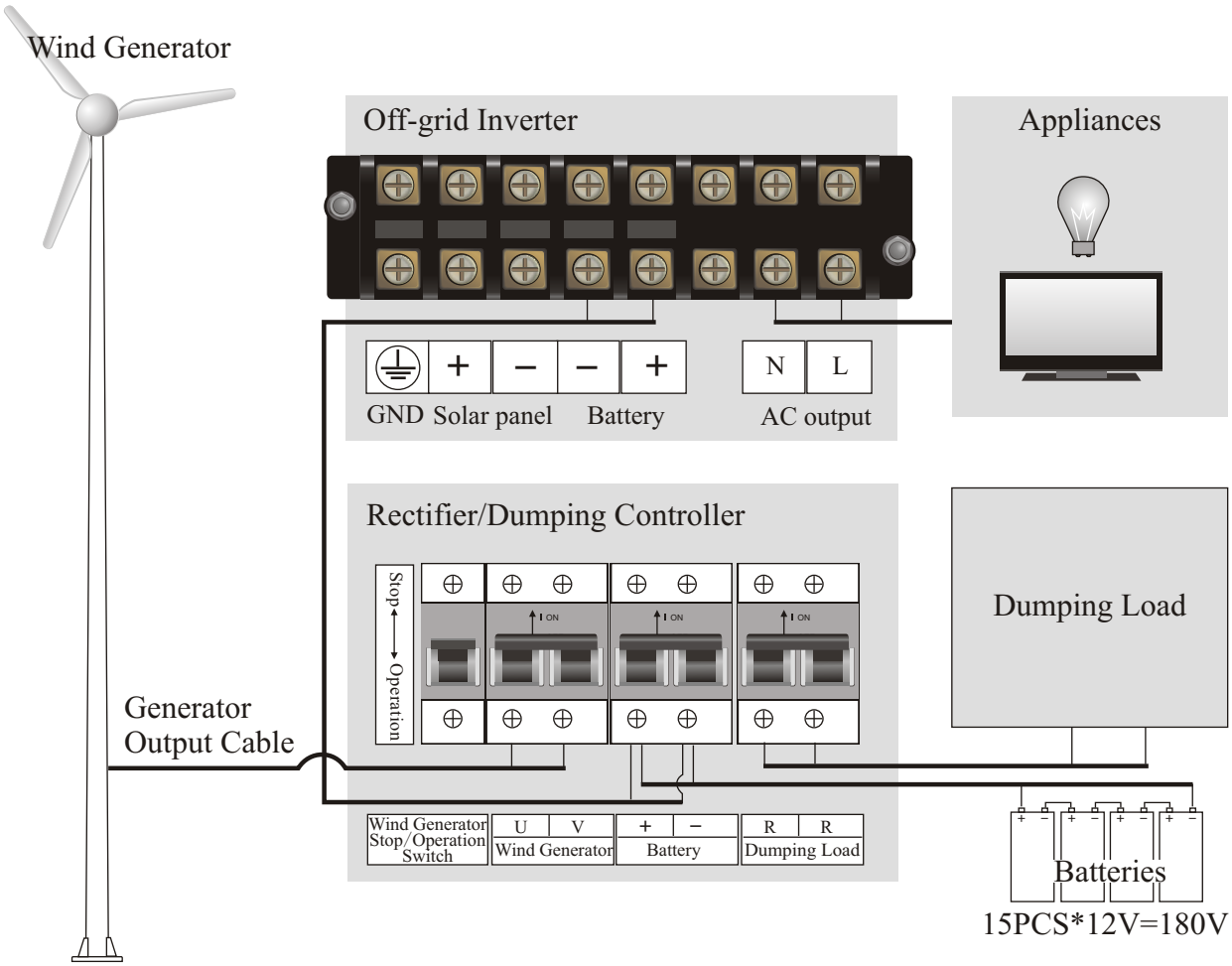
7. Connection of Wind Generator and Off-grid Inverter



7.1. Use two 6 mm² cables to connect the HUMMER-3KW off-grid inverter "Battery" terminal block to the relevant "Battery" switch on the off-grid rectifier/dumping controller. Be sure the "+/−" are correctly connected.

7.2. Connect appliances to the inverter "AC output" terminal block (L/N), Then starting up the inverter, the inverter will invert the DC voltage power offered by the batteries to AC voltage and supply power for the appliances.

7.3. System wire connection diagram



8. HUMMER-3KW Off-grid Inverter Technical Parameter

AC output	Voltage	220V
	Frequency	50Hz/60Hz
	Efficiency	>85%
	Wave	Pure Sine Wave
Wind Turbine	Voltage	180V
	Current	16.7A
	Battery	12V*15pieces
Power	Output AC Power of Inverter	3KW (Resistance load)
	Power of wind turbine	3KW
Noise	＜55dB outside 1 meter	
Temperature	0°C～40°C	
Humidity	20%~90%（non-condensing）	
Safety	Car fuses with high quality 30A	
Gross Weight	25.7 KG	
Net Weight	23.5 KG	
Dimension(W*D*H)	550×530×186mm	

9. Contact Us

You can contact us with the following methods, if you have any problem in your using. We will supply you the technology support and after service within the range of responsibility. Thanks again for your purchase.
The content of this manual is subjected to change without notice.

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10. Disclaimers

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HUMMER reserves the right of final interpretation of this manual.

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